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EUROPE REPORT

SCIENCE AND TECHNOLOGY

WEST EUROPE

SCIENTIFIC AND INDUSTRIAL POLICY

EAST EUROPE

ADVANCED MATERIALS

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WEST EUROPE/SCIENTIFIC AND INDUSTRIAL POLICY

EUREKA PROJECTS: FRENCH PARTICIPATION, FINANCING

Paris L'USINE NOUVELLE in French 20 Feb 86 pp 44-45

[Article by Marc Chabreuil: "Eureka: Power Build-Up"]

[Text] Ninety dossiers submitted for approval, 17 projects ready for registration, 16 new programs ratified in June... Eureka enjoys unexpected popularity among our manufacturers. So much so that France might spend Fr 3.2 billion per year by 1988.

Sixteen new Eureka programs, 13 with a French participation, will be definitely ratified at the next ministers conference to be held in London next June. Another 17 projects involving national companies seem advanced enough to be ready for registration in 3 months. Not to mention over 90 dossiers submitted for approval to Yves Sillard, the Eureka project coordinator for France. Obviously, this European program is more popular with our manufacturers than even its initiators would have hoped. Yet, no canvassing of companies was undertaken.

"We are now going to start an information campaign aimed at laboratories and small or mid-size companies, through the various regional delegations," Yves Sillard nevertheless indicated. Simultaneously, all information concerning the program as a whole will be gathered and distributed by the Eureka secretariat, which will probably be set up in Strasbourg around the middle of the year. Finally, toward the end of the year, a Eureka show geared to the general public will open its doors on the La Villette site. All this should lead to an expansion of the circle of participants, now mostly restricted to large companies. Since all projects are "open," newcomers will even be able to negotiate their entry into any one of them.

Yves Sillard estimates at 50 or so the number of projects in which France will be participating by the end of 1986. That number, he believes, is large enough to outline a profile of Eureka in the next few years. On the average, the programs will extend over 6 years and amount to Fr 450 million. They will continue to involve predominantly computer-integrated manufacturing, data processing and materials (over 50 percent of current all dossiers), but biotechnologies and the ocean will account for an increasing share.

France Represented in 60 Percent of the Programs

In addition, Yves Sillard does not rule out the launching of "large system" projects that would be more complex and would take more time, e.g., interurban communications through convertible aircraft, road traffic assistance facilities, automated ships controlled from the land, or space factories, etc.

He believes that French manufacturers will be represented in 60 percent of the programs, with the national contribution averaging 24 percent of the total cost. When the program reaches cruising speed, by 1988, this should lead to an annual expenditure of Fr 3.2 billion, a little over 50 percent of which would be paid by French companies.

This predominance of France is a cause of concern for many countries. As a whole, foreign companies are far more cautious: in 9 months, 41 dossiers were filed in the FRG, 27 in Great Britain, 23 in Italy... compared with 105 in France.

The 18 member countries, however, have all recognized the need for public financing, which will assume the most diverse forms (tax incentives, loans, subsidies, etc.). Therefore, the Old Continent would spend annually a total of Fr 13 billion or so to finance a network of 300 projects. Thus, "over 5 years, Europe would spend the equivalent of $10 billion for Eureka, i.e., 40 percent of what the United States are expected to spend for the SDI. In other words, the program will have a considerable impact on European industrial capacities in the field of high technology," Yves Sillard stated.

13 Projects to Be Ratified Next June

Participants	Period (Years)	Cost (Billion Fr)	French Share (Billion Fr)	Private French Financing	Objectives
Robotics, CIM					
Aerospatiale (Fr) Aeritalia (It) British Aerospace (GB) Casa (Sp), MBB (FRG)	5	200	70	50%	Exchange of information between aeronautical engineering departments (transferable to the automobile industry).
Eurosoft, Sagem (Fr) DSEA (It), Inisel (Sp)	5	200	100	50%	Fully-automated flexible electronic board mfg plant.
Matra, CEA (Fr)	6	700	273	50%	Advanced mobile civil-protection robots (1 high-speed carrier robot and 1 highly-mobile intelligent robot).

Cont.

Participants	Period (Years)	Cost (Billion Fr)	French Share	Private French Financing	Objectives
Aerospatiale, Bull, Seri-Renault, Certs-Onera (Fr) Brown Boveri (Swit) Aeritalia (It), Matrici (Sp), Ikoss, MBB (FRG), Absy (B)	6	200	80	50%	Automated production management system using artificial intelligence.
Materials					
Sodern (Fr), Dornier (FRG), Sener (Sp)	5	100	50	50%	Automatic neutron-diffraction device (metallic parts control).
Pechiney Alu, Peugeot SA, Desmarquest Ceramics (Fr), Fiat (It)	5	84	49	50%	Dev. of metallic and ceramic components for car engines.
Computers, Microelectronics					
(Fr), (Swit), (FRG), (A), (G), (T), (B), (SF), (GB), (Sp)	3	733.4	451.6	72.6%	Creation of the ES2 company; automated custom IC design and production by direct writing on silicon (production plant in France).
Thomson (Fr) General Electric Corp (GB)	3	410	205	57%	Design and production of AsGa microwave ICs.
Aerospatiale, Cap Gemini Sogeti (Fr), Det Norske Veritas (N)	5	190	125.4	50%	Expert system for crisis processing (natural and industrial hazards, etc.)
SFGL (Fr), Datamat, Sesa, Intecs, Selenia (It), CRI (Dk), CIR (Swit), Nokia (SF), (GB), (Sp)	6	773	334.3	35%	Software engineering plant; automated and reliable software production.
Thomson (Fr), GEC (GB)	2	130	52	54%	Development of a GTO high-power thyristor line for railroads.
Sesa (CGE) (Fr), RTL Products (Lux)	5	55.9	28.2	47%	European center for new synthetic image technology.

Cont.

Participants	Period (Years)	Cost (Billion Fr)	French Share	Private French Financing	Objectives
Environment					
Rhone-Poulenc (Fr) Solvay (B), Akzo (Neth)	5	55	13.5	50%	Detection and destruction of toxic chemicals with an UV excimer laser.

17 Projects Under Preparation

French Participants	Foreign Participants	Objectives
CIM, Robotics		
Metravib Components	CSEM (Swit)	Production line for mass-market integrated sensors.
Matra, Sormel, Cnet	Cambridge Instr. (GB) Convac, Fraunhofer Inst. (FRG), SGS (It)	Automated flexible micro-litrography line (ICs).
S. Dassault Electronics	CSEM, Battelle (Swit)	Automated IC inspection and testing.
IRCN, Normed, Alsthom-Atlantique, ACH	Fos, Flensberger Schifbau, Flender Werft, Thyssen Nordseewerke (FRG)	CAD/CAM applications in shipbuilding.
Matra Datavision	MBB (FRG)	Development of a new-generation 3D CAD system.
Materials		
SEP	MAN (FRG)	Dev. of a high-performance diesel engine using ceramic-ceramic componsites.
Peugot SA, Usinor-Sacilor, Elf, Pechiney, Cetim, Saint-Gobain	BASF, Bayer (FRG), ICI (GB), DSM (Neth), Vetrotex Italia (It)	Car bodies using new materials (20 percent cost reduction).
Bertin & Co., Vetrotex	Solvay (B), GKN (GB), Fruehauf (SF-FRG-Neth)	Use of new materials in semitrailer construction.
SEP, Hispano-Suiza	Volvo (Sw), Alfa-Romeo (It)	Use of ceramic materials in 5/20-MW gas turbines (5-MW model).

Cont.

French Participants	Foreign Participants	Objectives
Pechiney	VAW (FRG)	New materials and assembly techniques for transport.
Computers		
Bull, Inria, Cimsa/Sintra	Siemens, Atlas Krupp, GMD (FRG)	Feasibility study for a vector supercomputer and a highly-parallel computer.
CGEE-Alsthom, CGE, EdF	Philips (GB), Siemens (FRG), Telettra (It), Liege University (B)	Use of AI methods in large industrial project control and management.
Energy		
Alsthom, Sein Industrie	MAN, Lurgi (FRG)	Compact and non-polluting 300-MW high-sulfur coal, fluidized-bed power plant (for export). Possibly using titanium (vanes) and cryogenic alternators.
Biotechnologies		
Bertin & Cie, Merieux Institute	Immuno AC (A)	Large-scale culture of animal cells.
Clontec	Serono (It)	Line of diagnostic tests for pathogenic infectious agents, hepatitis and AIDs.
Sesif	IQB (Sp)	New calcium antagonist for the treatment of cardiovascular diseases.
Town Planning		
Bonna, SAE, Phenol Engineering	Zublin (FRG), Charcon Ltd, Tubo Fabrega (Sp), Bonna Buizen (Neth)	Implementation of an industrialized infrastructure (umbilical and energy-transport structures).

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WEST EUROPE/SCIENTIFIC AND INDUSTRIAL POLICY

LONDON MEETING ANNOUNCES 12 NEW EUREKA PROJECTS

Paris LE MONDE in French 19 Mar 86 p 16

[Article by correspondent Philippe Lemaitre: "A Dozen New Projects for Eureka"]

[Text] Brussels (European Communities)--The Eureka technological cooperation program launched on the initiative of France in April 1985, with the participation of 18 West European countries including the 12 Community members, is progressing satisfactorily although the many problems posed by such an undertaking are far from being all solved.

At the high-level group meeting that was held in London on 11-12 March, some 12 new projects were announced by the governments sponsoring the companies which are thus proposing to cooperate. They will be added to the 10 projects made public at the Hanover ministers conference in November 1985, and to the 16 projects announced at the previous high-level group meeting, last January in London.

All the projects thus "packaged" since the Hanover conference should receive official approval, i.e., they should be formally launched at the next ministers meeting, to be held in London on 30 June. Before that, another high-level group meeting is scheduled for 7-8 May.

The French continue to act as a driving force in all this even though, according to several observers, their determination for the time being is more apparent at political than at manufacturers level. "Companies are not yet fully at ease with the Eureka concept," one of the participants observed. Mr Yves Sillard, the French representative at the high-level group meeting, confirmed that France would allocate significant credits to Eureka: Fr 700 million in subsidies and Fr 300 million in Industrial Modernization Fund loans in 1986; after that, loans will remain at about the same level, and subsidies will amount to about Fr 1 billion in 1987 and Fr 1.25 billion in 1988.

Most of the other delegations have not made such a clear-cut commitment to provide financial support. However, all are playing the game, although with various degrees of enthusiasm. The Germans, the Belgians, the Dutch, which until now were not much represented, have announced several projects this time. However, the substance of the projects presented by the FRG does not seem to be in keeping with the industrial importance of the country. In addition, contrary to the other partner countries, the Germans are still not buying the idea that Eureka must privilege projects close to the marketing stage--a feature that distinguishes it from the programs implemented by the Community.

This orientation is also causing a central problem which was discussed, although not solved in London: what are the commercial benefits, the purchasing preferences that could be granted to the products obtained through the cooperation which is taking place in the Eureka context? The British seem to be especially interested in defining a label, which however would be hindered by the Rome Treaty regulations on competition. A formal compromise regulation seems difficult to put down in writing. On the other hand, we cannot exclude the possibility that, informally, in specific cases, without saying too much, some governments would try to privilege Eureka equipment in their public orders.

Task Distribution

Another difficulty might well be resolved. We mean the distribution of tasks among the operations undertaken at Community level and those undertaken under Eureka. Community programs will focus their efforts on "precompetitive" research, Eureka on projects closer to the marketing stage.

In order to achieve harmonious coexistence between the two, the commission suggested in London that Eureka projects which might use a very similar approach, and therefore might duplicate what is done at Community level, should be systematically identified. Similarly, it is also necessary to identify the projects, more numerous, which are the extension, the natural consequence of cooperative projects implemented in the context of Community projects like ESPRIT or RACE. This will make it possible to ensure the smoothest possible transition between the two levels.

Of the projects announced in London on 11 March, 10 have reached a more advanced stage than the others and were the subject of data sheets distributed to the delegations. France is participating in two of them. The first one, presented by Switzerland, has to do with the development or improvement of thin-layer and special-property film deposition technologies (e.g., on screens) for numerous industrial applications. The second one, presented by the FRG, has to do with the development of lightweight composite materials for transportation equipment. It was understood that it will be Sweden's turn to chair Eureka during the second half of this year, after France, the FRG and the United Kingdom.

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EUROPEAN RESEARCH NET PLANNING WITHIN EUREKA

Amsterdam COMPUTERWORLD in Dutch 4 Mar 86 pp 1, 6

[Article by Willem Koole: "Political Support Bringing European Research Network Closer"; first paragraph is COMPUTERWORLD introduction]

[Text] Amsterdam--"I estimate that the political consensus reached last month in Bonn by the 18 countries involved in EUREKA accelerates by about 2 years the existing plans for a European research network," said engineer F.M.M. van Iersel, senior consultant in Amsterdam's James Martin Associates.

The fast growing office of British origin is temporarily in charge of the RARE (Associated Networks for European Research) secretariat. RARE groups specialists in infrastructures and telecommunications. With the European Commission it is now going to develop further plans involving the industries concerned and the PTT [Post, Telephone & Telegraph] organizations of the participating countries.

As a first example, the implementation of an electronic mailing system based on the X.400 standard is under consideration. "Just a consensus on the standard to be chosen is so important," says van Iersel, "because before long it will enable all the national networks, including the Netherlands SURF network, to function as one European facility."

Van Iersel points out that a genuine consumer standard is under discussion and that the consumer has been taken as the starting point. This can easily be done as the whole field is still so new that there are no vested interests as yet and thus no contradictions to be reconciled.

A Timetable

Now that the further development of plans has been given a green light, a timetable will be established in June during the third ministerial conference of the EUREKA countries in London. The project provides for the overall coordination of national plans such as the one being developed in the Netherlands by the Cooperative University Calculation Centers [SUR] under the direction of Doctor J. Rosenberg. The SUR also represents the Netherlands within RARE.

The intention is to give RARE a permanent secretary this year with financial support from the European Commission. Last October, the Netherlands Ministry of Science and Education made its provisional start in Amsterdam financially possible.

The important role of the computing centers does not imply that priority will be given to linking these centers. This is only regarded as an additional possibility. Most important is the creation of a new facility for scientific researchers to exchange messages rapidly. This capability already exists between, for example, scientists in high-energy physics and users of the European laboratory CERN [European Center for Nuclear Research], but it certainly need not be limited to those in the exact sciences.

When asked for an estimate of the network's utilization in 5 years, van Iersel answered that 20 to 25 percent of the scientists in the exact sciences and 10 percent of those in other scientific endeavors in Europe will be involved.

This is a very rough estimate and, moreover, it does not tell us much about the intensity of the traffic expected on the network. Because a cultural change comparable to the introduction of the telephone system is involved here, forecasting is extremely difficult indeed.

Luxembourg

The intention to create a European network for scientific researchers was clearly expressed for the first time during a workshop held in Luxembourg in May 1985. The discussion resulted in the establishment of a steering committee for RARE under the leadership of Peter Linington of the British Rutherford Appleton Laboratory. The Netherlands is represented on the steering committee by C.A.M. Neggers of the Computing Center of the University of Nijmegen.

A great deal of the communication between committee members takes place electronically. This also applies to decision making. By the end of May, another large workshop will take place in Copenhagen.

Karl Zander, a German professor associated with the Hahn Meitner Institute in Berlin, is also one of the initiators. In the past he has organized meetings to reach an accord on communication protocols. The starting points, such as the utilization of the X.400 on the recommendation of the CCITT [Consultative Committee of International Telephone and Telegraph], were determined in Luxembourg. Moreover, it was decided to use only connections based on the X.25 standard. In practice this implies the use of PTT facilities.

The OSI [Open Systems Interconnection] model also plays an important role in the development of ideas. After that of exchanging messages, priority is given to transferring files (i.e., transferring large quantities of information) and to the compilation of directories of information services. To realize these plans effectively, an application has been made to the European Commission for a subsidy of 400,000 ECU [European Currency Unit] (approximately 1 million guilders).

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WEST EUROPE/SCIENTIFIC AND INDUSTRIAL POLICY

FRENCH BULL PROMOTING AI RESEARCH IN ESPRIT

Paris ZERO UN INFORMATIQUE in French 3 March 86 p 4

[Article by Edouard Lanet: "Bull Awaits the Wave"--boxed material at end of article]

[Text] There is an air of excitement about artificial intelligence at our national manufacturer. People are bustling around and they want everyone to know about it. Has Bull beeen hooked by the expert system? Why not? After all, its president did state: "Artificial intelligence is a cultural change, a kind of new beginning and thus a new opportunity for Bull to assert itself relative to its competitors." But to surf on this ground swell appearing on the horizon, it is necessary to have good surfboards, a perfect sense of balance, and a certain initial speed. And, after that, a strategy.

To obtain the initial speed, a team of "paddlers" has been formed at the Louveciennes research center, where an artificial intelligence department was opened in 1982. They have been paddling, in anticipation of intersecting swells, in three directions: knowledge representation and natural language, tools for logic programming and deductive data bases, and, finally, AI machine architecture.

Leading the strategy is Alice Recoque, whose AI Mission, begun in November 1984, will draw to a close next month. The goals have been defined and the organization has been set up. Training will now begin.

Expert Systems for Configuration and Maintenance Will Be Put into Service for the Medium Term

Thus Bull is converting to AI. An ad hoc structure, Cediag (Center for Expertise and Artificial Intelligence Development Group), created in August 1985, is directed by Philippe Roussel, coauthor along with Alain Colmerauer of the Prolog language.

The primary objective of this strategy is to present a coherent product line before the end of the year. It is not yet precisely known what products will be included in this line, but it will probably consist of a software package, primarily designed for the Micral, SPS 7 and SPS 9: LISP, Prolog and development tools for expert systems. Among the research prototypes capable of becoming products are;

--XLOG: a Prolog interpreter (standard used in English-speaking countries) for Micral. Full screen editor, split screen system, etc. Execution rate on the order of 200 to 270 LIPS (Logical Inference per Second);

--KOOL: development tool for object-oriented expert systems. Kool is based on LISP and runs on the SPS 7;

--Boum: expert system generator, also written in LISP;

--Schuss: accelerator of hardware access to data bases.

However, the role of a manufacturer is not only to develop software but also to offer large catalogs to users of its machines. Bull is studying the product-marketing strategies of companies such as Cril (MP - LRO), Cognitech (Tigre I), Tecsi (Intelligence Service), etc. Will we see (this is just speculation) S1 of Teknowledge and Art d'Inference Corp. run on SPS 9 in their version of C language?

In addition, participation may be arranged with certain software companies working in the AI area.

Meanwhile, AI is primarily an investment area for Bull. The manufacturer is currently devoting one-third of its research efforts to artificial intelligence.

This is also the occasion of a large-scale training operation: 200 managers have already been "exposed." A large number of the technical personnel should finish their training, on different levels.

Finally, internal AI applications, especially relating to maintenance and configuration, are under study, including the Diag expert system maintenance project. A feasibility study is in progress, with the MSU 452 disk (15,000 units installed) as the "guinea pig" which corresponds to a package of 200 replacement parts. An Emycin-type prototype, Diag-0 (0 motor and production rules) should be completed next June. Then Diag-I will be developed, which will incorporate variables and structured objects as well as knowledge acquisition and validation aids. Bull hopes to implement maintenance expert systems on a full scale starting the second half of 1987.

In Progress at ECRC: The Development of an Auxiliary Processor for Rapid Execution of a Compiled Prolog

The manufacturer is tackling configuration problems in the Noemie project. It involves the design of a hardware configuration expert system, in its technical as well as commercial aspects (i.e., with reference to systems developed by DEC, an XCON + XSEL package). A prototype is under study; it was developed on an SPS 9 with Kool and a relational data base. The first studies concern the configuration of DPS 7 systems. Noemie may enter the operational phase in 1987.

For a manufacturer, preparing for artificial intelligence involves first of all preparing its machines. It also specifically involves developing new machines. In this area, Bull is working on three large projects. The first is taking place within the framework of ECRC (Bull/ICL/Siemens joint research center) in Munich, another AI expertise center for Bull. It involves the development of an auxiliary processor for the rapid execution of a compiled Prolog--goal: 200 to 600 KLIPS--connectible to SPS 7 or 9, or usable as a work station or even as a "back end."

At Transac, an "intelligent" office automation station is under study. On the program are office expert systems, vocal interfaces, and coprocessors for AI.

Finally, the Louveciennes center is working, within the framework of the Non Von 415 Esprit project, on development of the DDC (Delta Driven Computer), a multiprocessor (16 to 256 units) machine, Motorola-based with Microschuss processors (data filtering). This project, which has 13 full-time employees, may result in an operational prototype toward the end of 1987.

[Boxed item]

Six Espirt Projects

Bull is participating in several Esprit projects connected with AI:

--Kims, in which the other partners are Siemens and CGE, concerned with knowledge representation languages;

--IWS, with several universities, which is attempting to develop an AI-based office automation station;

--Alpes, with Cril and the University, concerned with developments in the Prolog environment;

--Acord, with CGE, which concerns the understanding of natural language for the operation of data bases;

--ADKMS, with Olivetti, Nixdorf and Berlin Technical University, on the theme "deductive data bases and natural language";

--Non Von 415, with Philips, GEC, Nixdorf and CSELT, concerning the development of parallel machines for AI.

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EAST EUROPE/ADVANCED MATERIALS

CHEMICAL ASPECTS OF MATERIALS SCIENCE

Budapest MAGYAR TUDOMANY in Hungarian No 9, Sep 85 pp 646-652

[Article by Tamas Szekely (doctor of chemistry, director) and Janos Szepvolgyi (scientific team leader), Inorganic Chemistry Research Laboratory of the Hungarian Academy of Sciences]

[Excerpt] So far as the availability of sources of raw materials is concerned, that at first glance does not seem to be of decisive importance when designating the areas of research, because the "raw material input-output ratios" of high technologies are exceptionally low. It will suffice to refer to the industrially advanced countries' practice in this respect. But the range of phenomena is not so simple as might appear from the preceding. Examples abound to illustrate that the development of a synthesis is affected adversely by the scarcity of a raw material on which it is based, and favorably by the raw material's availability. Let us examine what effects encourage materials research based on domestic resources.

First of all we might mention making scarce substances available. Among our domestic resources we can include in this category the many materials that contain Ti, V, Zr or rare-earth metals. Of great significance might be also the deposits with which we could replace materials that are becoming depleted or are being imported (e.g., the substitution of tools made with Al_2O_3, for carbide tools).

The contribution of materials research toward making existing processes more economical is a factor that, in our opinion, has not been fully appreciated so far. What we have primarily in mind are not technological modernizations, but --simply stated--the fact that "it is not all the same where we cut off the successive production stages." By increasing the degree of processing, and by producing technological materials with more favorable technical characteristics, domestic industry could realize the extra profit that in many instances has been relinquished to foreign firms up to now. The actual interests of the national economy can be judged--to borrow a phrase from economics--also on the basis of the input-output table's inverse.

Development of the methods of synthesizing substances will contribute toward our forming a more complete picture of materials. The advances in solid-state devices requiring materials of high purity stemmed in part from utilizing the body of knowledge that accumulated on segregation, in the study of metals.

In our time, of course, the "market" for materials science research includes not only the few typical sectors (microelectronics, the plastics industry, engineering, the motor vehicle industry, etc.) that have been responsible, so to say, for the emergence of materials science, but also practically every area of economic activity and material production. Particularly important from Hungary's viewpoint are the advances of materials science in biology and farming practices ("biomaterials science"). However, even a sketchy outline of chemistry's enormous tasks in this field would far exceed the scope of this essay.

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EAST EUROPE/ADVANCED MATERIALS

MICROFORMS, MICROTECHNOLOGIES STATUS VIEWED

Budapest MAGYAR TUDOMANY in Hungarian No 9, Sep 85 pp 635-644

[Article by Jozsef Gyulai (doctor of physics, university professor, scientific department head at the Physics Central Research Institute of the Hungarian Academy of Sciences) and Ivan Szep (doctor of technical sciences, deputy director of the Applied Physics Research Institute of the Hungarian Academy of Sciences)]

[Excerpt] Hungarian Panorama

Materials science research has been assigned an important role in the concept of scientific research under the 7th Five-Year Plan. To a decisive extent, the renewal of our industrial structure demands the development specifically of those industries for which materials science provides the scientific infrastructure. The new devices of the electronic components and equipment industry, telecommunications and automation are inseparable from the knowledge that must be elaborated or adopted within the framework of materials science. Already because of the magnitude of this task, it will be appropriate to review the available domestic base.

From the viewpoint of this study, we will mention only the activities related to microelectronics, but without any claim to their complete coverage. Research institutes of the Hungarian Academy of Sciences (the KFKI [Physics Central Research Institute], the MFKI [Applied Physics Research Institute] and the KFKL [Crystal Physics Research Laboratory]) have successfully investigated the crystals of high purity that are used in the electronic components industry. On the basis of their scientific findings, modern electronic devices (band filters, magnetic memories, and laser diodes) have been made with these materials. The KFKI and the R&D laboratory of the Microelectronics Enterprise have worked out processes for obtaining silicon-oxide layers of excellent quality. The Microelectronics Enterprise, the KFKI and the MFKI have elaborated methods of epitaxial crystal growth and have used them to fabricate electronic devices. Among the layer-removal techniques, plasma etching is being used by the Microelectronics Enterprise and at the KFKI. Some results of the domestic research and development of ion-implantation techniques, at the KFKI in cooperation with Caltech and Cornell University, have become standard practice in industry. In terms of their technological level, the aforementioned results were suitable at the time of their realization. However, the curtailment of investment in recent years has not made it possible to keep abreast of technology, which is hampering the solution of future tasks. In some areas such as the technology of vacuum evaporation, for example, the almost complete absence of modern equipment practically prevents the fulfillment of the tasks to the appropriate standards. The development of several measuring techniques of high quality has made reliable control possible in some areas of microelectronics technology. We should mention, but again without any claim to complete coverage: the investigation of determining the composition as a function of depth, based on the backscatter of helium ions (KFKI); analytical electron microscopy (MFKI); surface and layer analysis based on secondary-ion mass spectroscopy (Physics Institute of Budapest Technical University); the method of detecting so-called deep-level impurities in crystals (DLTS), and the internationally acclaimed instrument developed for this purpose (MFKI). In the field of computer simulation, mention must be made of the work that is being done at Budapest Technical University's Department of Electronic Devices.

This material and personnel base will be available in the coming plan period as well. Regrettably, no significant expansion of this base can be expected. But it will be unavoidable to modernize and supplement the stock of equipment that this base holds, to enable it to perform its tasks in accordance with the requirements. The costs could be kept at a tolerable level by choosing the tasks sensibly, and through cooperation between institutions.

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FORMATION OF GRAIN ORIENTATIONS

Budapest MAGYAR TUDOMANY in Hungarian No 9, Sep 85 pp 653-659

[Article by Istvan Gaal, candidate of physics, scientific department head, Applied Physics Research Institute of the Hungarian Academy of Sciences]

[Excerpts] Modeling the Formation of Grain Orientation

Description of the formation of grain orientation may be divided into three broad questions: (1) description of the laws governing the formation of crystal nuclei in the phases; (2) description of the displacement of phase boundaries, from a knowledge of the local forces and mobilities; and (3) structural change of the phase boundaries, under the influence of the processes accompanying the formation of grain orientation.

The open questions in modeling grain orientation are as follows: (1) modeling the equilibrium and nonequilibrium structures of the phase boundaries, and comparison of the models with the results of structural analysis and materials testing (the question of cracking along the phase boundaries is unclarified even for the simple case when we have a grain-boundary impurity, instead of a phase boundary); (2) describing, by statistical methods, the formation of grain orientations of more complex geometry (there are promising efforts to describe the coarsening of the grains in single-phase materials); (3) exploration of the factors that determine the content of impurities in the phase boundaries, and description of the related kinetic processes (e.g., grain-boundary displacement induced by grain-boundary diffusion); (4) the possibilities and limits of relaxing internal stresses in the course of the changes in grain structure and, in conjunction with this, the investigation of relaxing the internal stresses associated with the volume changes in phase transitions and with the diffusion profiles.

There are several scientific schools in Hungary with good traditions in the investigation of the listed questions. Solidification, phase transitions and segregations, the deposition of layers from the vapor and the liquid phases, and diffusion have been investigated in our country for decades, by scientific schools of international renown. During the past five or six years, there have been meaningful domestic efforts to describe the statistical properties of morphological instabilities and grain structures. In this last area, particularly the theoretical investigations of percolation have been successful.

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EAST EUROPE/ADVANCED MATERIALS

NEW PROPERTIES OF SYNTHETIC ORGANIC SUBSTANCES

Budapest MAGYAR TUDOMANY in Hungarian No 9, Sep 85 pp 660-666

[Article by Gyula Hardy, corresponding member of the Hungarian Academy of Sciences, director of the Plastics Industry Research Institute]

[Excerpt] The question is warranted as to what research and development Hungary's size and economic potential allow in this field. In my opinion, our primary task is to train, and "to keep fit" for research, experts who will be able to monitor this worldwide development and make their specialized knowledge available to domestic industry when necessary. Research must be maintained where noteworthy results have been achieved, because the creative brainpower in this field is an important productive factor of the national economy. The following institutions have achieved results that have also evoked international response: the KFKI [Physics Central Research Institute of the Hungarian Academy of Sciences] and the Plastics Industry Research Institute (this author and his coworkers), in research of liquid-crystal compounds and polymers; again the KFKI, in research of polyacetylenes; and the Plastics Industry Research Institute and Budapest Technical University's Plastics and Rubber Industry Department, in investigating the production and potential applications of semiconductor and conducting polymers. The preservation and further development of these research centers will serve the long-range interests of domestic and international science, and of domestic industry.

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EAST EUROPE/ADVANCED MATERIALS

AMORPHOUS STATE OF MATTER: GLASSY METALS

Budapest MAGYAR TUDOMANY in Hungarian No 9, Sep 85 pp 667-675

[Article by Kalman Tompa, doctor of physics, deputy director of the Physics Central Research Institute of the Hungarian Academy of Sciences]

[Excerpt] Domestic Developments

Research of glassy metals began in early 1976 at the Physics Central Research Institute (KFKI), within the framework of the national principal research direction "Solid-State Research." I have on my desk a small Plexiglas box with bits of the first glassy metals produced in Hungary; they were made at our institute, before Christmas of 1976. The date is not a typographical error. The small box authentically documents the first developments in Hungary: already the first year, between October and December of 1976, the first Nb-Ni and Fe-B ribbons were produced by rapid quenching; and the first Ni-P and Co-P disks, by electrolytic etching. These were rather quick results.

Also noteworthy among the developments is that in 1976 the traditional spring training course of the KFKI and the Csepel Works reviewed the results reported in the literature and examined the possibilities primarily from the viewpoint of the available experimentation methods. The first domestic report on glassy metals was published in 1976. And for the Csepel Works Metalworking Plant we began to plan a curriculum that was completed in 1977.

The photograph on the title page [not reproduced] shows the essence of the first process employed at our institute. The melt is prepared by high-frequency heating in the small crucible that can be seen in the photograph. With the help of an inert gas, the melt is then projected against a disk rotating at a velocity of about 120 km/h.

Our first scientific papers appeared in 1976, but at the end of 1984 our list of publications contained more than 260 papers; the number of cooperating institutions was 16; and among the approximately 230 authors we find researchers from 16 countries.

Some comments to these statistics appear to be in order. Among the cooperating institutions we wish to single out the Csepel Works Metalworking Plant. From the very beginning, it provided moral and financial support for the research of glassy metals at the KFKI. Hungary's second laboratory for glassy metal technology is now functioning at the Csepel Works Metalworking Plant. Among the cooperating institutions there are also several universities (e.g., ELTE [Lorand Eotvos University], KLTE [Lajos Kossuth University], and BME [Budapest Technical University]).

International cooperation is a vital condition, for without it there can be only peripheral research. We believe that domestic research of glassy metals does not belong in the peripheral category, as evident also from our participation in international conferences. In 1978, at the international conference held in Smolenice, Slovakia, we presented already seven papers. In 1980, we held in Budapest the "Metallic Glasses Science and Technology" conference that all the front-runners in this field attended (with the exception of P. Duwez, whom illness prevented from attending). Here Hungarian conferees presented 36 papers. In 1981, there were more than ten papers by Hungarian authors at the "Amorphous Systems Investigated by Nuclear Methods" conference held in Balatonfured. In 1983, a likewise large number of papers (more than 20) by Hungarian authors helped to make memorable the "Soft Magnetic Materials, 6th" conference held in Eger. In the RQ (Rapidly Quenched Metals), LAM (Liquid and Amorphous Metals) and NCM (Noncrystalline Materials) sections of the big international conferences on amorphous and rapidly quenched metals, several invited Hungarian speakers demonstrated the international prestige of domestic research, despite the limited travel budget. I would like to close the presentation of these results by noting that the mentioned papers have been listed as references in about 700 other works. If we accept [Academician] Denes Berenyi's question for assessing the work of the Academy's research centers (Footnote) (Cf MAGYAR TUDOMANY, No 5, 1984, p 387), namely "how has the research center fared in international scientific competition," then the above lines have to be quoted back in answer.

As the other side of the coin, however, we have to quote also Denes Berenyi's second question: ". . . how has the research center met society's expectations; in other words, how has it benefited the society which provides the conditions for the center's research."

The results pertaining to this question are as follows:

--We have already mentioned the transfer of technology to the Csepel Works Metalworking Plant;

--We have been awarded two patents, and have filed two other patent applications, for inventions relating to glassy metals;

--We have supplied the construction industry with enough material to arouse its interest in using glassy metal fiber to reinforce concrete;

--Our noise filters have been installed in several elevators; and our small transformers, in switchboard power supplies;

--In the 1983 national contest of innovations for conserving materials, our entry "Substitution of Amorphous Alloys for Noble-Metal Coatings in the Production of Break Contacts" was awarded first prize.

Although modest, the listed results nevertheless prove that glassy metal researchers have replied in the affirmative also to the second question. But we also found that the process of science's becoming a productive force is not a smooth one, not even when society's "expectations" assume the concrete form of readiness to accept innovation, and "society" is reduced simply to one or more specific enterprises.

However, research of glassy metals has also taught us that the real coin, as opposed to the theoretical one, has a third side as well, or at least an edge. As a set of values for basic and applied research has not yet evolved in our country, assessment of the researchers' performance is subjective. The expectations, which change significantly from time to time, and assessment fluctuate between these two questions:

--At an institute of the Academy of Sciences, is there need for research that serves as a catalyst for production activity?

--Why is the result of application merely this much?

Between these two extremes, of course, there is also realistic assessment that encourages further work.

Returning finally to research as our principal activity, we concur with the view that more extensive analytical work can be expected of our researchers now that the period of rapid growth has ended.

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EAST EUROPE/ADVANCED MATERIALS

NEW MATERIALS IN OPTICS

Budapest MAGYAR TUDOMANY in Hungarian No 9, Sep 85 pp 676-687

[Article by Laszlo Csillag (candidate of physics, scientific main department head) and Norbert Kroo (corresponding member of the Hungarian Academy of Sciences, institute director), Physics Central Research Institute of the Hungarian Academy of Sciences]

[Excerpt] Domestic Results

Several Hungarian research centers are investigating phenomena that can be observed with the help of new optical materials.

Staff members of the Physics Central Research Institute (KFKI) have achieved significant results in the investigation of laser materials, the development of laser designs, and laser applications. One result of their research of neodymium in yttrium aluminum garnet (YAG) is a medical diagnostic laser whose optical output of about 100 W can be transmitted also into the body, through an optical fiber made of quartz glass. Experiments with neodymium glass, conducted in cooperation with the General Physics Institute of the USSR Academy of Sciences, led to the successful development of highly efficient glass lasers. The power density of the beam from a laser of small dimensions can reach 100 MW/cm^2.

In the class of tunable lasers, domestic researchers have achieved good results with dye lasers. One such laser, for example, is the pulsed dye laser pumped by a nitrogen-gas laser, developed at Attila Jozsef University's Department of Experimental Physics, in Szeged.

Investigation of the interactions between a high-intensity laser beam and condensed matter is a separate area of research. At the KFKI, a novel nonlinear interaction has been discovered between intensive, ultrashort solid-state laser pulses and electrons, and between a continuous laser beam and ordered liquid-crystal molecules. There has been fruitful research and development also in the area of laser machining, leading to the development of industrial equipment that is being used successfully for the adjustment of electronic components, micromachining, and the surface heat-treatment of semiconductors. Modern laser equipment has been developed also for high-precision measurement of distances and small dimensions.

The Crystal Physics Research Laboratory of the Hungarian Academy of Sciences, and Budapest Technical University's Physics Institute attained results in the production of crystalline optical materials, and in the development of devices based on such materials. They produced electrooptical and electroacoustical crystals, which they used to develop light modulators, deflectors and other laser-technology devices.

Laser crystals are not being produced in Hungary at this time, although the KFKI has the technical capability to do so: it is growing garnet for microelectronics applications, and thus it would be no problem to produce Nd:YAG or GSGG laser crystals.

The Applied Physics Research Institute of the Hungarian Academy of Sciences is researching semiconductor lasers that are based on the special properties of semiconductor materials (gallium arsenide, for example). These devices, which emit coherent light in the infrared region of the spectrum, are the signaling elements in optical communication, and with them it is possible to achieve several thousand times greater information densities and transfer rates as compared with the present wired communication systems. Experiments are already underway with laser transmitters developed domestically.

Regrettably, the initiatives to produce domestically optical fibers suitable for use in optical communication systems have remained unsuccessful. It is to be hoped that we will be able to supply from socialist countries our requirements for such optical fibers. However, we have the knowledge and favorable conditions for fruitful research in some areas of thin-film technology and integrated optics.

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EAST EUROPE/ADVANCED MATERIALS

NUCLEAR ANALYTICAL METHODS

Budapest MAGYAR TUDOMANY in Hungarian No 9, Sep 85 pp 688-691

[Article by Jozsef Gyulai, doctor of physics, university professor, scientific department head at the Physics Central Research Institute of the Hungarian Academy of Sciences]

[Text] The special methods of investigation that provide information on the composition of materials from samples of very small volume, without destroying the materials, play an essential role in obtaining the new scientific results in materials science. The number of such methods has increased rapidly during the past two decades. One cause of this rapid increase is that, in investigations based on interactions, researchers have not only been seeking the possible interaction, but have also been reversing their inquiry in the other direction: we perceive, detect the final product (ion, electron or photon) and its properties, and on the basis of this knowledge we then ask what can be said about the original state, composition, etc. of the material. In the Auger spectrum, for example, we observe the electron transition's energy and frequency of occurrence, from which we can then draw conclusions regarding the chemical composition and bonding of the material.

Which method is the most suitable and sufficiently "sensitive" varies with the given problem. At this point also a brief discussion of sensitivity will be in order, because this concept is not unambiguous. For example, some methods are exceptionally sensitive to trace elements (even in concentrations of the order of 10^{-9}); but if the quantities of trace elements on the surface happen to be arranged, say, in a submonolayer, then the method might be insensitive in spite of such detection sensitivity. In cases of this kind it is necessary to choose a technique that detects only in the near-surface region and determines the chemical composition per unit of surface area, rather than in terms of the customary unit of concentration (material/volume). Such theoretical problems aside, "easy, impressive" problems can be found for every method, and these are the problems that equipment manufacturers usually describe in their promotional materials. But there are also difficult problems, and even ones that can not be solved.

Among the newer methods in materials science, this article will attempt to acquaint the reader only with the ones that have become analytical methods by "turning around" the quantitative information content of nuclear interactions. The description of the interaction itself is not necessarily a recent result.

Let us first review the methods suitable for bulk chemical analysis.

The distinguishing feature of the techniques known collectively as activation analysis is their extreme sensitivity, especially if we include here also labeling with radioactive tracers. The most widespread variant is neutron activation analysis. Here neutrons--from a nuclear reactor or neutron accelerator--convert into (different) radionuclides the nuclides of the elements that are to be determined, and radiation-measuring techniques are used to measure, for example, the number of disintegrations of these new atoms, from which the concentrations of the elements to be determined can be computed. This technique is suitable for determining very many atoms in many kinds of matrices. A limit is imposed only by the unfortunate coincidence of half-lives and disintegration products.

In Hungary, such investigations have been going on for decades at both research reactors, and the method has spread even wider, thanks to a neutron generator of domestic design. At the Danube Iron Works, for example, it is being used for rapid determination of the oxygen content. In the wake of the long and fruitful work, examples of materials science applications can be drawn from a very wide circle, ranging from semiconductors to organic and even biological systems. Let us mention the determination of the distribution of dopants in semiconductor devices; or the detection of alkali impurities in transistors, which takes advantage of the method's high sensitivity. Many analyses are made to control the quality of indirect materials.

Also structural analyses can be made near a nuclear reactor: macroscopically, neutron radiography helps to detect concealed defects; and microscopically, using as a tool for structural analysis the diffraction that occurs when neutrons scatter, which leads to several so-called diffraction methods. Here we must mention first among the domestic achievements a Hungarian researcher's discovery of the spin-echo effect and its introduction to materials science investigations. Another impressive example is the analysis of fatigue in turbine blades by means of neutron diffraction. A variant of neutron radiography that has been developed recently also in Hungary (transmission radiography) is suitable for relatively rough, but no less useful, structural analysis.

X-ray diffraction and electron diffraction (the latter in transmission electron microscopy) are perhaps the most widely used techniques in structural analysis. Here we may draw conclusions from the formed diffraction pattern and trace back the crystal structure or amorphism.

X-ray diffraction measurements are more suitable for larger quantitites of materials. Electron diffraction requires attenuation of the samples, but this makes the analysis of much finer layer structures possible.

The techniques developed at the other domestic institutions aid, for example, the microelectronics or metals-research aspects of materials science; these are practically the only techniques for identifying the crystal structure.

The "resonance" techniques, namely electron spin resonance (ESR) and nuclear magnetic resonance (NMR), are suitable for obtaining much profound materials-science information about metals and semiconductors. As both techniques are sensitive to sites of loose coupling (spin), they have proven excellent methods for the investigation of crystal defects. Their sensitivity is so high that, for example, ESR is able to identify more than 15 kinds of defects in silicon slab into which ions have been implanted. The domestic achievements that fall within the scope of this report have stemmed primarily from investigations of the structure of defects in ionic crystals. The symmetries of several defects have been determined.

The NMR technique is one of the principal tools of domestic metals research, including research of amorphous metals. With its help we have been able to determine during the past 10 to 15 years the local spin distribution in many kinds of magnetic materials, its rearrangement under the influence of different types of treatment, etc.

Mossbauer spectroscopy, which provides information through the hyperfine interactions of atoms, soon entered the arsenal of investigation methods, as a technique for determining short-range atomic interactions. Since the 1970's, in the course of employing these techniques at the KFKI, increased attention has been devoted to systems that have their links to practical applications. In $LiNbO_3$, for example, the charge and coupling states and the environment symmetry were determined of the iron impurities that influence to a large extent the physical properties of the material. Especially interesting were the results obtained when the iron atom was formed in the crystal lattice after the cobalt isotope's electron capture: the short-lived metastable states after electron capture were successfully detected. The short-range atomic interactions in amorphous systems likewise attracted the researchers' interest. They detected the short-range ordering of amorphous systems, and they identified the processes by which the amorphous system gradually changes into a stable system. These investigations enabled the researchers to provide also a generally valid description of the behavior observed in the melts quenched earlier.

From the mid-1970's, within the framework of international cooperation, attention focused on the investigation of implanted layers. The Mossbauer effect has been proven a suitable tool for the investigation of such systems as well. It has been successfully demonstrated that the atoms' chemical interactions significantly influence the arrangement of the atoms in the implanted layer, and that the mechanical, so-called ballistic, effect is much less significant than was thought earlier. In this way it has been possible to interpret the arrangement of numerous implanted atoms in various lattices, including the long-debated arrangement of Co and Te in silicon, after implantation and heat treatment. Conversion electron Mossbauer spectroscopy (CEMS), which is highly sensitive, has also been introduced for the investigation of surface layers. With it we can investigate even absorption samples from the implanted layers.

Likewise noteworthy is the determination of the atomic topology of various ferrocene derivatives that are resistant to radiation.

The positron annihilation technique also counts as a nuclear physics method and has proven suitable primarily for investigating lattice defects. Its sensitivity to vacancy concentrations is higher by at least two orders of magnitude than that of any other technique. But to be able to draw suitable conclusions from the results of the measurements, it is first necessary to explore the basic questions of positron-solid interaction, and to determine the parameters of interaction essentially for every species of material and composition, because these quantities cannot be computed in advance as yet. The main objectives of the investigations now being conducted at the KFKI also point in this direction. In complex amorphous systems, primarily amorphous metals, the volume of voids has been investigated as a function of the production conditions and the heat treatment; it was found that the volume of voids is production-dependent and truly sensitive to heat treatment. The voids in amorphous metals do not represent clear vacancies on the basis of the positron parameters and are somewhat smaller in size.

Specifically because of their high sensitivity to defect sites, the positron annihilation techniques will be playing an important role in the future in the classification of species of materials.

The most widespread direct "nuclear physics" methods are Rutherford backscatter spectrometry (RBS), particle-induced x-ray emission (PIXE), and nuclear reaction analysis (NRA) where the nuclear reactions are induced by ions.

The spreading use of the RBS technique can be attributed also to the fact that low-energy (MeV) particle accelerators have become less and less suitable for nuclear physics research. (More accurately: only the most resourceful nuclear physicists have been able to use such accelerators for nuclear physics research of high quality.) In the first deliberate and impressive Rutherford backscatter analysis, the Turkevich team "was obliged" to use a source of alpha particles when determining in situ the chemical composition of the Moon's surface, in the Surveyor 5 experiment. Subsequently the Chalk River research team was the first to think of using a particle accelerator as the source of an ion beam, instead of a source of radioactive alpha particles. How can the chemical composition be determined quantitatively by this technique?

Here the information is contained in the backscattered ions that bounce off the sample's atoms; just as in the elastic collision of balls, their energies depend on the mass ratios. And if we take into consideration the slowdown of the ions as they traverse matter, we are able to determine the chemical composition also as a function of the depth measured from the surface. When analyzing crystalline materials, moreover, by means of the so-called tunnel effect we are able to simultaneously investigate also the orderly arrangement of the rows of atoms--in other words, the perfection of the crystal lattice--including the arrangement of the adsorbed surface atoms. The technique is "self-calibrated," which means that it does not require calibration.

If this technique becomes cumbersome or unusable due to similarities of mass, then PIXE or NRA analysis can be performed, using essentially the same equipment. PIXE and NRA eminently supplement RBS (but in their case calibration is necessary, otherwise only relative determination is possible).

These techniques have been introduced in Hungary very early and in good time. Moreover, Hungarian researchers (at the KFKI and ATOMKI [Nuclear Research Institute]) participated in the elaboration of these techniques and have made valuable contributions toward the development of the techniques' present capabilities.

Here a few examples will be in order, the more so because the materials science research that employs RBS as its principal tool has been conducted in an excellent international environment (in cooperation with the California Institute of Technology and Cornell University), as a result of which its impact factor is very significant.

The first step in our example was the realization (in 1974) that the regrowth, by annealing, of the crystal structure of a silicon slab, which has been amorphized by bombardment during ion implantation, depends on the slab's so-called crystal orientation and on the sample's "past thermal record." On the basis of this knowledge it was then possible to propose an implantation process that avoids--in integrated circuits, for example--many of the earlier problems relating to the structure of the material and to its lattice defects. Since about 1978, this process--elaborated to the level of a technology--has been incorporated into the production technologies of the leading firms abroad, and its advantages for the technologies of the near future are even more significant.

This same line of reasoning introduced into international competition also the so-called silicon-on-sapphire (SOS) technology that offers many special advantages but is coping with numerous problems associated with the structure of the materials. All advanced firms are using this process, in the elaboration of whose materials science principles Hungarian researchers have played an equal role.

In recent years, there has been concentrated investment activity in microelectronics in Hungary. Although our catching up with the lead is out of question, we should at least maintain our present lag that is measured in years. In absolute terms this still means a growing lag, because development in this field truly follows an exponential function. Linearization on the time scale is by all means in our national interest. This is something toward which the Hungarian research centers have been and are able to contribute.

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EAST EUROPE/ADVANCED MATERIALS

INVESTIGATION OF SURFACES AND THIN FILMS

Budapest MAGYAR TUDOMANY in Hungarian No 9, Sep 85 pp 692-697

[Article by Gyorgy Gergely, candidate of physics, senior staff member, Applied Physics Research Institute of the Hungarian Academy of Sciences]

[Excerpts] From the viewpoint of the future effectiveness of Hungarian materials science research, it is not indifferent what instruments, and of what quality, are available to research from the arsenal of instruments listed above, the list being by no means complete. It may be termed favorable that practically every one of the techniques listed in Table 1 can be found at least at one domestic research center, although we should add that usually the instruments for them are not the most modern versions. Through their published papers, the work of these research centers has gained recognition also in international professional circles. Among the methods discussed here, Auger electron microscopy is being used at the Physics Central Research Institute of the Hungarian Academy of Sciences; at the Academy's Isotope Institute and by its Reaction Kinetics Research Group; and also at Budapest Technical University's Physics Institute. X-ray photoelectron spectroscopy is employed at the Academy's Physics Central Research Institute, Isotope Institute, and Inorganic Chemistry Research Laboratory. Secondary-ion mass spectroscopy is being done at Budapest Technical University's Physics Institute. Investigations with scanning electron microscopy (SEM) are being pursued at the Academy's Physics Central Research Institute, Applied Physics Research Institute, and Geochemistry Laboratory, but such versatile equipment can be found also at the industrial R&D institutes and at factories (Metal Industry Research Institute, Iron Industry Research Institute, and Microelectronics Enterprise). For transmission electron microscopy (TEM), the Academy's Applied Physics Research Institute has developed highly sensitive techniques for microanalytical applications. With the help of highly efficient ion-beam attenuation equipment, samples suitable for TEM analysis have been obtained even from bulk materials, and their lattice defects could be observed directly.

Identification of the crystal structure of surface atom layers, which is being done at the Academy's Reaction Kinetics Research Laboratory, is based on the scatter and diffraction of the low-energy (less than 200 eV) electrons with which the surface is bombarded. The Academy's Applied Physics Research Institute designed and developed the instrument for deep-level transient spectroscopy, an outstanding achievement even by international standard. This same institute is now working on developing further the applications of this technique.

Table 1. Modern Investigation Techniques in Materials Science

Excitation \ Output	Thermal	Electric, Magnetic	Optical	X-ray	Electrons	Ions
Thermal	DTA DSC	TSC DLTS	Emission spectrum			Mass spectro-scopy
Electric, Magnetic		Galvano-magnetic EPR, NMR				
Optical		Photo-electric	Atomic absorp-tion IR-UV photolu-mines-cence		UPS VUV spectro-scopy	
X-ray				Fluores-cence spectro-scopy, Diffrac-tion	XPS ESCA	
Electron beam			Cathode lumines-cence	Micro-probe, Diffrac-fraction	AES, EELS SEM TEM	
Ion beam						SIMS Ion probe, RBS

Key to Abbreviations:
DTA - Differential thermal analysis;
DSC - Differential scanning calorimetry;
TSC - Thermally stimulated current measurement;
DLTS - Deep-level transient spectroscopy;
EPR - Electron paramagnetic resonance;
VUV - Vacuum ultraviolet spectroscopy;
XPS - X-ray photoelectron spectroscopy;
ESCA - Electron spectrometry for chemical analysis
AES - Auger electron spectroscopy;
SEM - Scanning electron microscopy;
TEM - Transmission electron microscopy;
SIMS - Secondary-ion mass spectroscopy;
RBS - Rutherford backscatter spectrometry;
EELS - Electron energy loss spectroscopy;
UPS - Ultraviolet photoemission spectroscopy.

Besides listing these techniques, it must be established that the available stock of instruments is undergoing rapid obsolescence due to natural wear and the rapid international development of instrument technology, and thus it will hardly be suitable for the research tasks of the coming period. Although our domestic research centers are maintaining close contact with well-equipped foreign research institutes, this cannot serve as a solution for the fulfillment of the domestic tasks. Renewal of the worn-out stock of instruments cannot be delayed any longer. With due consideration for the available financial possibilities, central coordination of the procurement of expensive scientific equipment would be desirable, in the interest of its optimal utilization. In addition, of course, we will continue to rely on the research and development work of our inventive researchers and engineers, through which they fill domestically the gaps in our stock of instruments and modernize our existing equipment.

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EAST EUROPE/ADVANCED MATERIALS

MODERN STRUCTURAL AND TOOL MATERIALS

Budapest MAGYAR TUDOMANY in Hungarian No 9, Sep 85 pp 697-701

[Article by Professors Istvan Artinger (candidate of technical science) and Tibor Konkoly (doctor of technical science), Budapest Technical University]

[Excerpt] This essay, in accordance with its objective, has presented a general overview of the development of structural and tool materials, dwelling in greater detail on the new types of steel and treatment. In the following, again without any claim to complete coverage, we will list the subjects of the R&D projects that are underway even now, and we will indicate also the research locations involved:

--The use of rapid heat treatment in the production of steel strip: Budapest Technical University's Institute of Applied Mechanics and Structure of Materials - Danube Iron Works;

--Electron-beam spot melting and surface treatment of tool steels: Budapest Technical University's Institute of Applied Mechanics and Structure of Materials - Csepel Iron Works;

--Improvement of the ductility of rolled rods: Iron Industry Research and Development Enterprise - Salgotarjan Metallurgical Works - Ozd Metallurgical Works - December 4 Wire Mill;

--Elaboration of optimal metalworking technologies for the production of hot-rolled products: Iron Industry Research and Development Enterprise - Danube Iron Works;

--Further development of the vertical production technology for rolled steels of improved cold formability: Ozd Metallurgical Works - Heavy Industry Technical University's Department of Metallurgical Mechanics and Metalworking;

--Material- and energy-efficient production of high-strength cast iron: Csepel Works Iron and Steel Foundry - Budapest Technical University;

--Design and production of material-efficient tools: Budapest Technical University's Institute of Applied Mechanics and Structure of Materials - Budapest Technical University's Department of Machine Industry Technology - BDGMF Department of Machinery Production Technology;

--Development of welding materials: Csepel Works Metalworking Plant - Budapest Technical University's Institute of Applied Mechanics and Structure of Materials - Iron Industry Research and Development Enterprise;

--Development of modern heat-treatment technologies (e.g., ion-beam nitriding): Machine Industry Technological Institute - Driving Mechanism and Paint Spraying Equipment Factory;

--Development of the metallising of tool materials: Iron Industry Research and Development Enterprise - FORCON;

--Accelerated development of a data base for active counseling on steels: Metallurgical Machinery Design Bureau - Iron Industry Research Institute.

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EAST EUROPE/COMPUTER SOFTWARE

STATUS OF HUNGARIAN SOFTWARE PRODUCTION, EXPORT

Pros, Cons of Software Export

Budapest FIGYELO in Hungarian No 6, 6 Feb 86 p 6

[Article by G. T.: "Successes and Traumas"]

[Text] Our software export increases by 30-40 percent year after year--or at least it has in the past few years. The foreign exchange receipts from this approached 8 million dollars last year. This is also gratifying because computer technology intellectual export is very economical. Hungarian software people and a few Hungarian software products have a good reputation in countries with developed electronics too.

Perhaps a volume of a few million dollars does not seem too large on the national economic scale but the close attention of foreign trade to this unique area is justified, not only because of the favorable dollar production index but also because what is involved belongs to the sphere of "high tech."

One need not dig too deep to discover that the branch bringing these export successes is struggling with serious problems. Analyzing the composition of software export it can be established that the sale of computer programs prepared here at home makes up only a small percentage, the great majority of the receipts come from the "hiring out" of the intellectual capacity of the software experts. What is the reason for this? Why do we not make more exportable program products?

We might start with the fact that what is made in Hungary are primarily special purpose systems and custom software which could be offered on the foreign market only after significant modification. And developing general program packages--for example those linked to operating systems--is accompanied by great expenditure and great risk, so few undertake it. In addition, it would be necessary to produce marketable products from each idea very quickly, within months.

A prolonged assignment abroad is substantially more advantageous for a programmer than developing software at home. Hiring out their experts is simpler for the enterprises too because the small investment--not too much money is turned to training and preparation--brings in foreign exchange quickly and surely. And if a program package promising success is put together the present foreign trade and foreign exchange management rules make very difficult or even impossible the additional expense of several tens of thousands or a hundred thousand dollars to advertise the software. And handing over the trading rights to a foreign vendor means giving up a significant part of the profit. This happened in the case of the world famous Hungarian game software products.

A permanent foreign market presence would be important too. The software should appear at the same time as the sale of the newer and newer micro and mini computers--which virtually cannot be followed from here at home. According to the computer technology experts one can expect a profit from foreign representatives or offices only 2.5-3 years after they are formed--and maintaining them costs several million forints per year. Domestic organs and rules consider this an extraordinarily long time.

Unfortunately, even viewing the dynamic growth of software export, we have no cause for "hurrah optimism." Indeed, we should rather agree with those who, on the basis of the situation at the moment, view the years ahead with anxiety and some gloom. It is not possible to study software export divorced from the domestic computer technology environment. Using the analogy "the champion sports are the mass sports," only a "mass" growth of quality domestic applications systems and highly trained software experts can produce a staff of "champion software experts." We do not have adequate tools--the supply of hardware suffers qualitative and quantitative deficiencies and our backwardness in software preparation technologies is growing. It happens ever more frequently that our foreign trade enterprises do not find applicants with the special software-hardware expertise and good language knowledge required by the foreign partner.

The computer technology firms, be they large enterprises or GMK's [business partnerships], the programmers doing export work and the foreign trade people alike have suffered numerous traumas already in the "matches" being played for software export. The deal of one fails because of a cheaper bid by a domestic competitor while the other is "crucified" out of professional jealousy, with the slogan "If we did not succeed then the neighboring castle should not succeed in grabbing it." It also frequently happens that, leaving a large enterprise, a few software experts form a GMK to sell their intellectual capital, making use of the market contacts of their former place of work, and doing the work more cheaply. Small entrepreneurs who are really enterprising do not view such things with favor. And the professional competence of the foreign intermediaries and agents coming to Hungary recently and the quality of the trade work being done by them are debatable.

All these facts and experiences were voiced at a meeting held at the end of January at the initiative of Interag, at which the majority of the domestic firms interested in software export were represented. They agreed there, for example, that there is a great need for an information center or network from which domestic software producers could obtain detailed information about the possibilities and needs of the capitalist software market. At present a good number of the deals come into being on the basis of chance meetings and not as a result of deliberate market research and marketing. And in order that our good reputation should not to be ruined by "cut-rate" deals they also mentioned the need for an agreement that no Hungarian software expert should sell his expertise more cheaply than a certain low limit.

And at the meeting they said more softly than its importance warrants that our enterprises should think to a substantially greater degree about joint export undertakings and concentrated development. They should do so in the interest of speed and flexibility also. They should bring together the Hungarian software export capacity, which is being scattered more and more.

Development of Convertible Accounting Software Export (Millions of Forints)

1980	1981	1982	1983*	1984	1985
128.5	151.2	179.8	154.0	266.7	385.6

*The foreign trade statistical classification according to the registry of machine data processing products is used beginning 1 January 1983. The decrease in export shown for 1983 can be attributed to the change in the accounting method; actual export increased as compared to the preceding year.

Myths About Software

Budapest HETIVILAGGAZDASAG in Hungarian No 8, 22 Feb 86 pp 50-52

[Article by Zoltan Tompe: "Nine Myths; Suppositions Concerning Software." The first paragraph is an editorial introduction.]

[Text] How does the domestic software industry measure up in an international comparison? In connection with this question there are a number of myths in the professional and lay public awareness in Hungary, according to the engineer-economist author of our following article, who takes issue with these suppositions.

There appears to be a new sort of widespread Hungarian illness in that some people sometimes magnify and puff up partial successes while others--just the contrary--belittle and deny them. In studying Hungarian software I would not like to fall into this error. For this reason, in what follows, I will list a few software myths and the denial of them. Everyone may find a viewpoint pleasing to him. Let us compare the "bird's eye view" and the "bug's eye view" of Hungarian software.

First myth: Hungarian software is world famous. This is one of those areas where we are at the world level.

Hungarian software really does have a few achievements recorded at the international level. One can mention first the PROLOG programming language, but SZIAM, SOFTORG and IBM PC program developments and a few other products can also be regarded as at the international level. But the domestic software supply is not satisfactory either qualitatively or quantitatively. There is an over-supply of wage acounting, inventory record, accounting, bookkeeping and other general economic programs. There is a shortage of software systems aiding planning work and supporting creative intellectual work, there are practically no really comprehensive computerized management systems, good network software is very rare and software aid for process control and industrial automation is hobbling along. It causes less damage if secretaries and bookkeepers work with low efficiency than if designing engineers and production systems do so. In regard to mass domestic applications the condition of Hungarian software is embryonic.

Second myth: We have many well trained software experts.

There is no well developed software training in Hungary. The software experts "develop" from mathematicians, economists and engineers. According to surveys there is a very great shortage of well trained experts in the enterprises. The really well trained work abroad or here, but they work for customers abroad.

Third myth: Hungarian software is an outstanding export item. In recent years software export in the capitalist relationship has increased by 30-40 percent per year.

Receipts from software export in the capitalist relationship still amount to only 7-8 million dollars per year. They lag behind, for example, the receipts from the export of Hungarian goose feathers or domestic rabbits or edible snails. In addition, the term software export often means that we are not offering software, we are offering experts. We are selling manpower and not products. There is a trade in human beings instead of selling programs. We do not put the big money in our pockets, the foreign partners do. Really good deals could be made by selling programs accompanied by appropriate marketing actions.

Fourth myth: Software export is a very good deal. Indeed, it has a profit margin of 50 or even 100 percent.

It really is a good deal. A medium West German programmer costs a West German firm 160-200 marks per hour (Hungarian export goes almost entirely to the German language area). They get the best Hungarian people for 120 marks. It costs a Hungarian foreign trade firm about 70 marks for the software expert handed on for 120 marks. In addition agents with foreign commissions visit Hungary, select the best programmers and GMK's and employ them for a forint sum corresponding to an hourly wage of 40-50 marks. These programmers are happy to work for 1,000-1,200 forints per hour, because this is still six times the hourly wage of 150-180 forints they could earn in a GMK and thirty times the hourly wage of 35-45 forints they earn at their main job. So this is a good deal for everyone. Everyone makes out, but one. This one is called Hungarian software.

Fifth myth: The dynamic nature of software export and the liberalization of foreign trade are proven by the fact that about 15 enterprises are selling software on the capitalist markets.

Four enterprises (Metrimpex, Interag, Videoton and Intercooperation) conduct the crucial part of software export. The other small firms dealing with software export devote a part of their energy to obstructing the deals of each other. The four or five big ones try to make agreements with one another, but it appears that they are trying to establish a cartel with which they can force the other ten "out of bounds."

Sixth myth: Software is a special commodity which requires good brains; it does not require much material or energy and the investment need is relatively small. So in this respect it is "made to order" for a country like Hungary with limited resources.

It is a popular error to believe that paper and pencil are enough for software. One needs competitive hardware tools for competitive software development. Hardware tools worth at least 200,000 marks are usually found on the desk of a West European software expert. As long as tools worth this much, measured even in forints, are not on the desk of the Hungarian expert the software products he prepares can hardly be competitive. Sooner or later the lack of hardware tools will set back the development of software too.

Seventh myth: Software goods have an innovative character. Every program is actually a new discovery, almost an invention, certainly an innovation.

It is a great disadvantage for the Hungarian software industry that it is not task oriented but rather is program oriented. In developed capitalist countries the most common goal is to complete a given task in a very short time, supplying it with suitable documentation, with great precision and reliability. In most cases this requires a knowledge of the finished tools and their efficient use, that is, pure craft work. The domestic goal is preparation of custom, tailored programs, polished to minimal size and technical perfection. Here the time, reliable operation and precise documentation are not essential conditions. In many cases existing programs and the auxiliary tools used are kept secret or "conjured away", the program is mysterious, only its creator knows it, and lacking suitable documentation only he can, for the most part, operate it or modify it. The mysterious fog and "invention" character of programs prove that programmers, like the priests of ancient Egypt, should be the exclusive possessors of all knowledge, and, of course, there are significant material aspects to this. Software products with a really innovative character have a very small share of the domestic market. In volume a large number of them consist of small management programs written for the Commodore 64 hobby computer. Even today an average of two or three different wage accounting, bookkeeping, inventory, etc. programs are prepared each month in Hungary. One has to pay 5,000 forints for a duplicated, standardized wage accounting program. One can ask 85,000 forints for a "custom", "made to order", "innovative" wage accounting program.

Eighth myth: Several extraordinarily positive measures of recent times ensure the replacement of experts for the software industry. Such things as, for example, the TV-BASIC course and the school computerization programs.

Without casting doubt on the really great significance and utility of these things, we must note the following here. Software writing has laws and internal interdependencies which can be well codified, learned and further developed. It is no exaggeration to speak today of a software manufacturing technology. Most Hungarian software writers have mastered the most modern technologies of software manufacture only at a very rudimentary level and only a few even know the internal laws of software writing. Mastering the BASIC language is light years away from the most modern software manufacturing technology; indeed, it is far away even from software writing. We should guard against those who, knowing the BASIC language, feel that they know how to write software, who believe that they have mastered the technology of software preparation. If an order of values is not restored masses will dilute the camp of software writers with their basic knowledge of Commodore BASIC.

The first subjects of the school computerization program entered the universities this year and there are more and more young university students with home computers. The experiences of the university instructors are not too favorable. These children manipulate the joysticks fantastically, they know what IF and GOTO are, some write marvellous little independent programs, and they believe that this is computer technology, this is software writing. Those who think in terms of IF and GOTO find it more difficult to accept the deeper and broader basic information. It does not follow from this, of course, that there should not be secondary school computer technology instruction; but it should be a little different.

Ninth myth: The appearance of the flexible little organizations, the GMK's, has given new life to the market. In the increasingly competitive situation prices have gone down, the level of services has gone up, the market has a healthy sparkle and the commodity character of software has strengthened.

Where one can speak of some sort of market at all it is not the software products but rather the firms that are competing. There are no significant differences in the quality or price of the individual program products. It would be a great mistake to believe that the software GMK's are getting their orders on an open market, in a sharper competition situation, with their better services or even with their lower prices. It is a fact that there are such cases. But in essence most GMK's are built on one or a few enterprises; they get their orders from one direction, thanks to friendship and good personal contacts, often guaranteeing themselves for a year or for years with a framework contract. So in the strict sense of the word they cannot be regarded as entrepreneurs.

The large software producing enterprises are in an absolute monopoly situation. The monopolization is very great especially in the provinces. In some parts of the country there is only a single computer technology service enterprise to be found high or low. And, thanks to its system of contacts, it is virtually omnipotent. It is not rare for the GMK's to be hit by discriminative measures.

In the course of very subjective bargaining--at the time of signing a contract--the providers of the service establish a final sum for carrying out the task. So only later does it turn out how profitable the job was. So the subsequently calculated hourly fees of the enterprises vary between wide limits--115-300 forints per hour. These limits are a good bit wider in the case of the small undertakings. As a function of good personal contacts or dependence they vary between 60 and 800 forints per hour. In general the small undertakings make bids 30-40 percent lower than the enterprises. But in some "friendly" situations it turns out that the GMK's are working for about the same price as the enterprises, of course with minimal overhead. In the provinces the hourly fee of the GMK's for intellectual work is most often 150 forints; in Budapest it is 180 forints. As long as the market is monopolized and as long as the user is not really cost sensitive there can be no talk of price competition.

The appearance of the small undertakings has increased the market offering almost exclusively in the area of simpler applied software preparation for microcomputers (primarily the Commodore 64). And the large enterprises are not primarily interested in this part of the market. In Budapest 90-95 percent and in the provinces 98 percent of the small undertakings concentrate on micro-software. But 68-80 percent of enterprise receipts come from fee processing on large machines. The whole thing is as if the Zaporozsecek, preparing for the Forma 1 and world competition, were to be made to compete with tourists on bicycles, but on the basis of "tranquility is better" the bicyclists were directed onto a different track.

Ongoing Debate About Software

Budapest HETIVILAGGAZDASAG in Hungarian No 12, 22 Mar 86 pp 54-55

[Article by Gyozo Kovacs: "Computer-Technology; The Debate About Software." The first paragraph is an editorial introduction.]

[Text] Although we did not intend our article about the status of domestic software (HETIVILAGGAZDASAG, No 8, 1986) as a debate article we now make space available in our journal for the following response. The author is vice president of the Janos Neumann Computer Sciences Society. We want to note at the same time that we would be happy to see and publish additional contributions.

There is world-wide agreement that the so-called peak technologies exercise significant influence on the economic development of various countries and even on the effectiveness of their social activity. As is well known these peak technologies include electronics and one of the most important branches thereof, computer technology. It is well known that at the beginning of the 1970's there was a significant backwardness--on the order of a decade--in domestic manufacture and use of computer technology compared to the countries which were leading from the computer technology viewpoint. (And there is still backwardness in certain areas.)

Among the many reasons for this is the well known fact that the development of computer technology and of software therein requires significant investment of material and time and increasing attention and even active efforts on the part of society. In this theme also there is a need for a clash of differing opinions and for objective debate, because we must find a path while building on the experiences and resources at our disposal--by no means unlimited--in order to catch up with or at least approach the still swiftly developing computer technology level of the most developed countries. Criticism which strives for objectivity can help much in recognizing and correcting non-optimal trends and methods. But positions formulated without proper circumspection can lead to discouraging the experts interested.

In his article (HETIVILAGGAZDASAG, No 8, 1986) Zoltan Tompe chose as a method of discussing the status of Hungarian software the formulating and answering of nine questions--which he calls myths. Unfortunately the article fails to say--or at least indicate--in whom these myths live, who formulated them or whether they reflect real or only distorted, exaggerated positions. As a result the article of Zoltan Tompe--despite what can be presumed was a helpful intent--suggests, in my opinion, that errors are characteristic of domestic software, that our "software crop" is beset by numerous vermin. It appears that the achievements indicating noteworthy development in some cases or connected with products which are promising for the future can be regarded only as supposed achievements or, what may be even worse, as myths.

So the reader is unable to decide whether software is an adolescent with good prospects who needs polishing and help in the interest of fitting better into society or a patient about whom one must prepare a diagnosis and who must be cured--if at all possible.

Actually the author is studying four problems in nine parts. These are the following:

1. The value and place of Hungarian software in the country and in the world (myth number 1),

2. The positive and negative aspects of software export (myths number 3, 4 and 5),

3. The problems of expert training (myths number 2 and 8), and

4. The status of software manufacture (myths number 6, 7 and 9).

I must say in advance that I probably am not able to judge the cause of software objectively and without prejudice, for I see the problems from inside, from being too close if you like.

Computer technology started in Hungary at the end of the 1950's with a backwardness of decades compared to the industrially developed countries. I consider it at least thought provoking that when we talk about the decline in the marketability of many of our classic products, about the deterioration in the terms of trade and about our increasing backwardness in the technical level of some branches of key importance there have been achievements in software development considered front rank at the international level, even world famous, such as MProlog and SIAM and SOFTORG, also mentioned in the article by Zoltan Tompe.

The fact that we have developmental achievements recognized even on the market does not mean that we do not have problems in domestic software supply. And it is true that we also have an over supply of data processing programs. But this lack of balance is a world phenomenon. If someone looks at an international software catalog published in a state which is developed from the computer technology viewpoint he will sense the same thing, namely that the simpler the task being solved by a computer the greater is the enterpreneurial spirit and the greater the supply. But if someone should want to compute how many programs which can really be used in the most modern applications areas, such as CAD/CAM, are being offered in this same catalog then his fingers would suffice for the computation.

I agree with Z. T. that there are applications areas for which no one is manufacturing domestic software. Unfortunately Z. T.'s article can be taken to mean that the programmers should start working on, for example, an industrial automation program, instead of writing another wage accounting program. Obviously this cannot be done without further ado, for high level knowledge of the applications area is needed to write effective programs. (It is probable that more people have had experience in wage accounting than in automation.)

In connection with the positive and negative aspects of software export let me say in advance that there is no expert (nor can one be imagined) who really understands software who would consider the present volume of software export the most important factor in judging software export. Let us look at this a little more closely.

Hungarian software export started in the mid-1970's, thus a good 10 years after the birth of of domestic computer technology. Z. T. says that the export receipts "still amount to only 7-8 million dollars per year, thus lagging behind, for example, the receipts from the export of Hungarian goose feathers...."

I do not deny that the volume of software export today still approximates the order of magnitude for goose feathers--especially not if goose feather export is to be regarded as some sort of value measurement--but I consider it more important that we study the question as a trend of development. In this light the annual growth of our software export, started barely 5 years ago to a market until then unknown to us (the developed capitalist market), has been 30-40 percent and already it is producing 7-8 million dollars per year. (This is a fundamentally different way of looking at it.) It is perhaps superfluous for me to say it, but in order to evaluate export activity a number of other factors must be studied if we are to be able to pass judgment. For example, software certainly falls in the progressive direction of social production activity, its dollar yield is not bad, and thanks to the export work young experts are able to link into the blood circulation of the professional computer technology world.

It is well known that it is a basic peculiarity of computer technology products that they consist of building blocks which can be used in a number of different applications. Thus, despite the fact that developing these building blocks represents very great intellectual work, and thus expense, the investment is paid back from multiple sale of the "modules."

If these modules are to be marketable on both foreign and domestic markets we must satisfy a series of collateral conditions as well. Thus we must use the developmental technology asked for by the customer and we have to know the current product assortment and demand of the given market. In a word, without fundamental market and technical information it is not even worth trying to sell the product. Looking back over recent years, neither domestic software development nor foreign trade had the above mentioned technological and market information.

Even on a world scale computer science is young and the deliberate domestic development of it can look back on an especially short time--about 15 years. From this derives what is still a world-wide phenomenon, that the best domestic software experts have obtained their knowledge by training themselves. These experts, possessing the experience acquired, developed the institutional software training of today, primarily in institutions of higher learning or in study courses.

TV BASIC--it really would be a myth, but I have not yet heard that anyone seriously held the doubtless "flattering" opinion, that TV BASIC would provide an expert base for the software industry. Despite the fact that on the domestic and foreign markets as well young, talented people generally prepare the software it would still be an exaggeration to presume that these children, most of them in their teens, will be able to play an active role in industrial software production when they are 20-25 years old. Remote instruction is not generally introduced for the purpose of training professional software experts but rather--and TV BASIC was introduced for this purpose--to awaken in the many an interest in computer technology, to "demystify" the use of computers and make it possible for those in whom an interest in the profession was awakened to become outstanding experts sometime, people dealing with software professionally. One can easily imagine that the broad instruction within the framework of remote instruction could have the result of giving many a desire to study further.

The preparation of modern, well articulated, easily reviewed, suitably documented software products, those following the so-called rules of software technology, looks back on a past of at most 10 years even on a world scale, and one cannot speak of the general acceptance of it even in the most developed countries. Because of the late start the situation is still a bit less favorable for us. So--I believe--when studying the environment and status of software manufacture one must refrain from one thing, generalization. Z. T. is right that there are very many programmers who try to "conjure away" the programs and create a situation so that only he alone knows the program prepared by him, only he can operate it or modify it. I know another camp as well--and I believe it is the greater--to which belong those developmental institutes where industry type software manufacture is developing more and more, where there are technological prescriptions, and as a result of this programs are prepared independent of persons, programs which anyone can maintain, modify and follow.

The market competition between the small undertakings and the large software producing enterprises also deserves closer study. It is my opinion that after the initial "conflicts" a balanced situation is beginning to develop; the large domestic software houses are trying to solve the larger and more investment intensive tasks while the small undertakings are trying to develop smaller volume systems--primarily in a personal computer environment. I do not believe that anyone today would seriously think that software could be manufactured only with good brains, only with paper and pencil. It can be easily demonstrated that one cannot produce domestic or export products this way, for to manufacture software one must create a machine environment of at least the level in which the program will be used, and the products must be tested in that environment.

In general it is true that the desks of the software developers of domestic organizations do not have even approximately the value of hardware as do those of their foreign colleagues doing similar work. But the larger domestic software houses have an advantage (together with the existing disadvantages certainly) over the small undertakings that they can provide the necessary computer background for carrying out their software development tasks more economically, or making better use of their computer technology tools.

A good brain and a computer of adequate power--perhaps with several hundred terminals--are conditions for efficient software manufacture, but even this is too little--an environment to receive the software is also very important. This is not mentioned in the article by Z. T., but the user motivates the software developers, indeed--very frequently--he influences the level of the developmental work. It is no small task to create a circle of demanding users, to really educate the software users so that they will not accept, even by chance, "foggy" or "conjured" program products and will prescribe--if they order a program--technologized software development and not even think, for example, of developing a demanding database management program for a Commodore 64.

Finally, I would be happy if Zoltan Tompe would accept the additions I have listed, for I do not cast doubt on a significant part of what is mentioned in his article. At most I would emphasize some of his findings differently.

For this reason one more observation presents itself to me. The domestic achievements in the area of software are not perfect, naturally, and despite the fact that the foreign professional and daily press gives many positive evaluations of Hungarian software activity it is not at all of world-wide importance. So the history of domestic software is far from being an epic. But those working on the preparation of domestic software perhaps merited something different--instead of the deheroization so fashionable today. Perhaps they deserve a few reassuring words and constructive, if you like helpful, criticism.

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EAST EUROPE/MICROELECTRONICS

TECHNOLOGY, GOALS OF MICROELECTRONICS ENTERPRISE

Budapest FINOMMECHANIKA, MIKROTECHNIKA in Hungarian No 6, Jun 85 pp 161-164

[Article by Janos Bonifert, of the Microelectronics Enterprise: "New Developmental Directions for Hybrid Circuits." The first two paragraphs are the Hungarian language summary.]

[Excerpt] A new electronics revolution is taking place the chief driving force of which is LSI/VLSI technology. LSI/VLSI development is bringing with it a spread of surface mounting and a proliferation of methods for preparing the interconnection network.

The article reports on the three chief assembly techniques for hybrid technology at the MEV [Microelectronics Enterprise]. These are:

--traditional hybrid circuits assembled with SM [surface mounting] parts (figure 1),
--multichip hybrid circuits (figure 2), and
--preparation of multilayer ceramic devices (figure 3).

Traditional Hybrid Circuits Assembled with SM Parts

Hybrid circuits assembled with SM parts and cast in a synthetics housing with one or two rows of sheet terminals make up the great majority of the hybrid circuit manufacture of the enterprise. Development began with this design so we can call it traditional (figures 4 and 5). We prepare a passive network of circuit carriers with thick and thin film technology and fix miniature parts on this with the SM mounting technique. Such parts include the SOT-23, SOT-89, SOT-143 and SOD-80 capsule type transistors and diodes, the SO-6 through SO-28 capsule type integrated circuits, chip condensers and chip resistors in a standard size and value series and other miniature design parts (figure 6). The thick film network contains the interconnections, the mounting contacts for the hybrid parts and the resistance networks. We use the thin film network when there is a need within the circuit for narrow tolerance, low temperature coefficient resistors or resistance networks. The combination of a thick film and thin film network is common also. We give the finished circuit assembly a synthetics coating to protect it from the environment. By mounting the circuit unit on a printed wiring sheet the user gets a guaranteed building element carrying out a complex function and set at the final parameters.

According to the professional literature the manufacturers of electronic devices will, beginning in 1985, be gradually forced to buy from the parts manufacturers not so much discrete custom parts as devices carrying out complete functions. So it can be expected that in the future we will increasingly regard hybrid circuits as "hybrid assemblies," "hybrid cards" or "hybrid modules." The assembly of printed wiring sheets will be transformed into so-called secondary level assembly. The chief cause of this trend is the increasing relative expense of nonproductive manual labor, or the constraint to automate assembly. Automatic, very productive mounting and soldering machines are very expensive, so they are purchased only by those enterprises which can operate large lines of them in continuous operation and amortize their equipment. The use of complex circuit modules is more favorable in the assembly of the less mechanized printed wiring sheet.

In the mid-1980's it became obvious throughout the world that the assembly of printed wiring sheet also must be modernized by those manufacturers who want to sell large series. The Japanese and American firms manufacturing consumer electronics were able or hope to win the murderous competition and decrease production costs by introducing SM mounting of printed wiring sheets. In the developed European countries the recognition has been followed since 1984 by increasing investments and as a result, within a few years, SM will make up a significant proportion of competitive electronic assembly technology.

Hybrid Multichip Circuits

The multichip mounting technique began to be used in hybrid technology at the beginning of the 1970's but it was not able to win a striking success (considerable receipts) around the world because of the arising technical and economic difficulties, not counting the war industry applications. The reasons for this involve two important facts:

--the insufficient assortment of chip parts, and
--the undeveloped nature of chip mounting technology and the resulting bad yield ratio.

The unbroken development of hybrid technology in the 1970's encouraged the firms manufacturing parts and assembly machines to acquire a hybrid market; indeed, it encouraged the largest firms to set up for hybrid circuit manufacture. The reliability of hybrid circuits won the recognition of users.

As can be seen in figures 7 and 8, hybrid multichip circuits contain a number of small semiconducting "naked" chips and other miniature chip parts mounted to a passive network developed on a ceramic or glass carrier. A metal-glass or metal-ceramic hermetic capsule makes the circuit assembly into a circuit unit which can be handled well by the user.

The passive network is prepared on the ceramic or glass carrier with thick film screen printing or thin film technique. The complete lack of soldering is a typical characteristic of chip assembly. Wiring and adhesive procedures are used to make electric contacts.

Prior to encapsulation we subject the finished assembled circuits to a multiple cycle testing and correction rotation from which only the perfect devices go on to the encapsulation operation. Thus the original high waste ratio is reduced to a very small final waste. The expensive test-correction procedure is needed because of the absence of preliminary testing of the chips. In general only the static parameters of semiconductor devices can be tested in chip form, the suitability of the "sharpened" dynamic characteristics (for example, time constants, environmental effects, offset displacements, saturation voltages, etc.) can be determined with the final measurements.

Although the waste ratio of the semiconductor chips assembled into a circuit is not high in itself (5-10 percent), in the case of a 10-20 chip circuit the circuit yield falls below 50 percent. With the test-correction cycles one can achieve a yield of 85-90 percent.

One cannot expect a spectacularly large technological change in the area of hybrid multichip assembly technology up to 1990. Further development will be provided by minor technological modifications and exploitation of the possibilities (complexity, speed, etc.) of the chips offered by the semiconductor industry:

--Linking IC chips prepared with various wafer technologies (figure 8);
--Thick film conductor-resistance networks covering large resistance ranges on the carrier chip;
--Precision, narrow tolerance and low temperature coefficient thin film resistors and resistance networks (figure 8);
--Thick and thin film chip resistors in standard sizes with standard value tolerances (figures 6 and 8);
--Use of miniature active and passive parts (figure 6); and
--Use of silicon carrier, ultra small resistance networks (resistor-on-silicon).

Multilayer Ceramic Devices

A manufacturing technology for multilayer ceramic devices was developed in the 1970's for the American war industry. In the 1980's the market accessibility and relatively low price of LSI-VLSI semiconductor devices demanded for consumer and industrial electronics also a capsule design with many terminals, not requiring much space and at an acceptable price. With this the theoretically existing so-called multilayer or monolithic ceramic devices spread to the area of civilian electronics. Ceramic chip carriers and PINGRID devices (figures 9 and 10) became the hermetic capsules of the custom, gate array and memory large chips used in semiconductor technology. The world-wide spread of these ceramic devices can be expected by the end of the 1990's. One cannot imagine modern, high complexity semiconductor devices without multiple terminal, multilayer ceramic capsule elements ensuring a hermetic seal.

When preparing multilayer ceramic devices one starts from a thin, still not burned-in Al2O3 ceramic film. After the foil is cut and holed the conducting networks are formed on the surface of the several layers with screen printing and connections between the several signal levels are formed by metaling over the holes. The material for the conducting stripes is wolfram or molybdenum.

The screen printing step is followed by pressing together a number (3-30) of layers and the multilayer raw ceramic body is sintered at about 1,500 degrees Celsius in a reducing gas medium (figure 11).

Following sintering the wolfram or molybdenum conducting layers remaining free are rendered solderable with gilding (chip carriers) or nickeling (multilayer ceramics). The conducting terminal wires of the multilayer ceramics are fixed by hard soldering to the nickeled terminal spots on the lowest ceramic layer. The terminals of the ceramic module are placed in the junction points of a 2.54 mm matrix (figure 11).

When mounting on the printed wiring sheet the 2.54 mm raster distribution terminal arrangement represents something easier as compared to the 1.27 mm terminal distances of the chip carriers. One hundred terminals can be placed on 7 square centimeters if we use the entire surface (figure 12).

The MEV, in cooperation with the KOPORC [Electronic Parts and Technical Ceramics Enterprise] and with the aid of central support, intends to make ceramic capsule elements for domestic parts and hybrid circuit manufacture.

Summary

The MEV, as the chief base for domestic microelectronics, regards it as a fundamental task to supply domestic equipment manufacturers with modern circuits and parts. This task is complex, because the enterprise has a determining role in:

--development and manufacture of modern semiconductors,
--satisfying the hybrid circuit needs of the country,
--manufacture of surface mounting active and passive parts, including harmonization of the passive parts manufacturing program taking place with other enterprises, and
--the domestic spread of modern assembly techniques.

Constant research and development for a hybrid circuit technology which is competitive even on the world market is an important sector of this many-sided task. The three chief assembly technologies for hybrid circuits can develop adequately only together, in a constant mutual relationship, and the ratios of one to the other can be developed only by attending to the technical and economic (market sales) factors.

PHOTO CAPTIONS

1. p 161. An 8 bit DA converter prepared with the thick film technique assembled with SM parts (SO capsule IC's, SOT-23 capsule transistors and diodes) HDA-06.

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MODERN HYBRID IC'S OF THE MICROELECTRONICS ENTERPRISE

Budapest FINOMMECHANIKA, MIKROTECHNIKA in Hungarian No 6, Jun 85 pp 165-166

[Article by Laszlo Kun, of the Microelectronics Enterprise: "Modern Hybrid Integrated Circuits From the MEV". The first paragraph is the Hungarian language summary.]

[Text] The article describes the developmental strategy for the hybrid integrated circuits of the MEV [Microelectronics Enterprise]. It describes the three areas where significant research and business successes have been attained. These areas are signal transformers and sensors, active filters and high frequency circuits.

The creation of the Microelectronics Enterprise and realization of the investments of the government program meant not only a crucial step for the manufacture of monolithic integrated circuits in Hungary but also gave a new impetus for the manufacture of hybrid integrated circuits, which can look back on a successful past. This impetus had an effect primarily in two important areas. One is the family of catalog circuits and the other is the area of sensors.

In the case of catalog hybrid integrated circuits it became possible to develop the earlier units made mainly of discrete elements (primarily A/D and D/A converters) into qualitatively new modules with greater precision and capabilities which could be sold better than the previous ones while preserving the advantages of the hybrid integration technique. New monolithic elements, partly developed at the MEV and partly obtainable within slowly but surely improving international cooperation, made it possible to develop 12 bit A/D and D/A converters which have the advantage that they are equivalent to a targeted western type in both size (binding) and technical electric characteristics. The DAC 80 model family accepted as the target type (as a result of a long observation of import and partly as a result of deliberate guidance) corresponds to the HDA 20-24 series while the ADC 80 type corresponds to the HAD 13 A/D converter. At present the domestic equivalents of the target types are in experimental manufacture and a standard study of the circuits is under way.

With this development (and with the very significant technological development behind it) many earlier types become superfluous. At present the MEV offers converters for various purposes in a very broad range. A brief summary of these can be seen in tables 1 and 2.

Table 1. D/A Converters, by Resolution

8 bit	10 bit	12 bit	15 bit
HDA 08	HDA 10	HDA 15	HDA 16
	HDA 20/10*	HDA 20*	
		HDA 21*	
		HDA 22*	
		HDA 23*	
		HDA 16/12	

* New development.

Table 2. A/D Converters, by Resolution

8 bit	10 bit	12 bit
HDA 08	HAD 10	HAD 13*
(tk 10 micro s)	(tk 20 micro s)	(tk 50 micro s)
HDA 09*	HAD 11/11*	
(tk 3 micro s)	(tk 50 micro s)	

* New development.

The converters described are supplemented by a line of various complete, micro P compatible input and output units with standard terminal element arrangements and mounted on a printed wiring sheet. At present the MEV Hybrid Branch manufactures 18 different measurement data collection cards fitting an 8 bit micro P bus. The number of input channels is generally 16 and the resolution is 8 bits (HDAS 02), 10 bits (HDAS 03, HDAS 16) or 12 bits (HDAS 04, HDAS 13, HDAS 17). The resolution of the analog output units is 8 or 12 bits and the number of channels is two (HDAS 07) or four (HDAS 18).

The measurement data collection cards are built on the most modern parts base, in the great majority of cases out of domestic devices or devices from socialist sources.

The small measurement data collectors can be attached well to various personal and professional computers. Our hybrid applications customer service has great experience in fitting to Commodore, Spectrum and IBM PC (Proper 16) computers.

The measurement data collectors constitute a sort of bridge to a new area of hybrid technology, the various sensors. The experts of the MEV recognized in time that modern machine manufacturing technology, the chemical industry, safety technology, robotics and mechatronics make it necessary to transform very many sorts of physical characteristics into electric signals. As a result of technological and circuit design work done during the Sixth 5-Year Plan there is a complete family of sensors which not only transform a physical process into an electric signal but also, as an organic component of the sensor, transform it into a standard signal which can be "understood" by the measurement data collectors.

The most widely cultivated area of hybrid integration is the "custom designed" circuits. Today this activity represents 70 percent of world hybrid IC manufacture.

Circuit designing work is broadest here, for one must solve quite varied tasks, the circuits must operate under extreme climatic conditions (from minus 55 to plus 220 degrees Celsius), and a guaranteed life expectancy must be produced.

The hybrid circuit designing activity of the MEV covers the DC-10 GHz frequency band and the 1 mW-50W dissipation range.

Our enterprise also manufactures active RC filters with both the thick film and thin film hybrid technology.

In the course of network theory and design work which began more than 10 years ago we have made active filters which virtually cover all industrial needs.

A computerized program system aids our theoretical work. The program system can calculate the following types of approximations.

Gauss approximation: The answer given for unit pressure is free of overshooting. Recommended for pulse technology applications.

Bessel approximation: Recommended for approximate constant running time requirement (near linear phase). Maximally flat approximation. This method is free of fluctuation, can be used to design monotone decreasing pass band filters.

Chebyshev approximation: This characteristic is justified if the attenuation in the pass band can have a prescribed even fluctuation.

Inverse Chebyshev approximation: The characteristic in the pass band is maximally flat, even fluctuation in the cut-off band.

Elliptic (Cauer) approximation: The attenuation functions designed in this way have even fluctuation in both pass and cut-off bands. This method gives the smallest order of equation for a given specification. It is an approximation of the general attenuation characteristic (non-standard approximation). This method also makes possible an approximation of complex step cut-off band requirements, with an optimal (smallest order of equation) solution.

The approximation program places the attenuation poles in the cut-off band in such a way that the attenuation curve evenly approaches the step specification in the entire cut-off band. The pass band can deviate from the traditional approximation. For example, the low-pass can be maximally flat anywhere in the pass band.

With this theoretical background we have available the following services in the area of active RC filters:

--We have made complete filters with fixed parameters for frequently used applications. These include filters for a two channel, low speed FSK modem--HBP 12, HBP 07, HBP 06; filters for a two frequency signal receiver system--HHP 04, HHP 03, HLP 04; a filter for a 600 baud FSK modem data channel--HBP 14; a filter for a 1,200 baud PSK modem data channel--HBP 15; and a double hole filter for 50 Hz--HNF 01.

--We approximate and make filters according to the special requirements of the customer. These are the so-called "custom design" circuits.

Our most recent research is aimed at designing and realizing SC and digital filters.

The advantage of the hybrid technology appears especially in the manufacture of high frequency and microwave integrated circuits. Using the thin and thick film technique the value and effect of the parasite elements are small and are constant due to the precision of manufacture. This effect can be taken into consideration in advance to a large degree with the aid of computerized circuit design.

The best path in high frequency circuit design is interactive optimization, in which the designer has a way, while the program is running, to structurally modify the circuit or to change the form of the optimizing error function.

After actual manufacture of the circuit measurment on a measurement automat gives an answer as to how the designed specification and the specification of the prepared circuit differ from one another. In the event of a larger deviation, naturally, the model must be refined until the designed and measured data cover one another to the required degree.

With the aid of the computerized method described above we can design broad band amplifiers, narrow band amplifiers, linear final amplifiers, filters, switches, attenuators, etc. The frequency range of the broad band amplifiers made at the MEV embraces the DC-1,300 MHz frequency band.

The characteristic input third order intercept point value of the linearity of the linear amplifiers can be, for example, plus 25 dBm, while the second order intercept point can be plus 60 dBm.

These amplifiers can be used, for example, in communications systems, where great linearity is extraordinarily important. The noise factor of the amplifier circuits can be a few dB. The amplification can have a given value or is regulated electronically with PIN diodes.

The fluctuation of the amplification in the given frequency range can be a few tenths of a dB and this is nearly the same for every circuit due to the reproductable manufacture.

The upper limit frequency of the distributed parameter attenuators made at the MEV is now 18 GHz. These attenuators are being used in digitally programmable equipment.

By expanding the sphere of active and passive parts which can be obtained it is expected that the upper limit frequency of the high frequency circuits made at the MEV will increase further.

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MAGYAR ELEKTRONIKA, TABLE OF CONTENTS

Budapest MAGYAR ELEKTRONIKA in Hungarian No 1, 1986 pp 2-3

On Our Cover

On our cover is the VT 32, Videoton's new, high powered microcomputer. One of the characteristic features of the machine, built on a 16/32 bit processor, is the VME bus, which greatly accelerates data processing. The uSOS operating system has a UNIX compatible interface; this increases the power of the machine and the many ways it can be used. Erzsebet Fenyves, who guided the development, describes the basic structure and the most important software and hardware properties of the new microcomputer.

Microhardware

In our Microhardware column we can read about digital signal processors in addition to the VT 32. Tibor Tuzson, a developmental engineer for the MEV [Microelectronics Enterprise], provides a review of digital signal processing from the viewpoint of an integrated circuit designer. This area, which is developing extraordinarily dynamically today, is becoming increasingly important in our country too, so the MEV has begun development of its signal processors. In addition to a general description the author also outlines domestic planning.

Technology

For the first time in our journal we are publishing an article by a foreign author. Lothar Blossfeld is a developmental engineer for the Intermetall Gmbh. The West German firm sent his article to our journal in addition to ELEKTRONIK. The CI technology is linked to digital signal processing as it was developed to make digital TV circuits. The earlier known collector isolation bipolar technology was developed further with the use of ion implantation, thus the transistor dimensions are 14 times smaller than with the traditional pn junction isolation technology.

Software

In his article Kristof Petery introduces a nice example of using a microcomputer. The program developed for an M08X machine offers great help when preparing water reserve management maps of Hungary. This method of preparing chartograms is not only cheaper than the traditional hand methods, not only reduces the throughput time, it also has the advantage of computer preparation of figures suitable for direct press duplication. The author also describes how statistical data can be illustrated by comparing various weighting methods.

Devices

Jeno Palfalvy--in keeping with his earlier promise--again appears on the subject of video recorders. The series beginning now will describe the structure and operation of the Orion-Panasonic video recorders. The series will not give operating instructions for users but rather will describe the circuit and systems solutions for those interested in electronics. The first part analyzes the process of picture recording and playback.

Further Training

The software people get a little titbit in our Further Training column. Bertalan Szilassy is starting a series on the C language. This language, little known today, is a tool for professional programmers. Its advantage is that it stands closer to the high level languages but at the same time can be handled easily for a translating program. In the first part the author describes the place of the theme with a brief historical review and then describes a few general properties of the C language.

Control Technology

The series by Sandor Mucsi is intended primarily for those who want to get close to modern control technology, who want to learn about the use of modern microelectronics in this special area. In the first (introductory) part the author studies the basic structures and the effects of the introduction of microelectronics. He also briefly reviews from the technical and economic viewpoints the advantages of modernizing measurement and control technology.

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EAST EUROPE/MICROELECTRONICS

HUNGARY'S VT 32 COMPUTER SYSTEM

Budapest MAGYAR ELEKTRONIKA in Hungarian No 1, 1986 pp 12-15

[Article by Erzsebet Fenyves: "The VT 32 Computer System"]

[Text] The VT 32 system is the newest and largest capacity member of the Videoton microcomputer family. It can be used independently or connected into a network, primarily to support office automation and computerized designing. The article describes the chief characteristics and structure of the system, the assortment of modules and peripherals, and the chief elements of the basic software and applications software.

Introduction

The VT 32 is a 16 bit microcomputer with modern architecture. Its capacity and level of service are comparable to earlier minicomputers in office versions and in size.

The chief characteristics of the system are:

--It is modular to a high degree, which makes it possible to build up various devices which are compatible with one another: an independent computer with one or more work stations, a work station which is a part of a distributed computer technology system, or a service station....

--It can be expanded simply in the event that tasks increase;

--It is built on a modern element base and technology;

--It uses standard interfaces (both hardware and software interfaces).

Hardware Structure of the System

The functional block diagram of the system can be seen in Figure 1. We can speak of three basic module types--processor module, memory module and couplers. To a large extent the modules have been made independent of one another. Most of them can execute activities parallel in time. They are in an informative relationship or superordinate or subordinate relationship with each other via the system bus.

We selected a high performance VME bus as the system bus (common specifications of the Motorola, Mostek and Signetics firms). It is based on an asynchronous master-slave concept. The modules use the bus in a concurrent way; this is aided by a four level priority decision. The permanent or high speed masters are connected to the higher priority bus request lines while the buffered or changing speed peripherals are connected to those with lower priority. Data with widths of 8, 16 or 32 bits can be passed on via the system bus--depending on the current master request--and data width can change dynamically, each bus cycle. The address domain of the bus is 16 M bytes. Its interrupt system has seven levels and several units can be connected to each level. So-called topographic priority is realized among units requesting an interrupt at the same level.

A so-called local bus (see Figure 1) branches off from the processor module. It has 16 data and 24 address lines. In contrast to the system bus there is no concurrent operation here. The processor creates a programmed link of the master with the other units. Data traffic on this bus can take place in parallel with the data traffic of the system bus. It is appropriate to connect to the local bus those devices which require a direct processor link (arithmetics expansion, local memory, etc.). The local bus and the processor interface also have the possibility for connecting "cache" memory. (It will be developed later if there is a need for greater capacity.) With the use of cache memory the 32 bit data width of the bus could be used by the processor also. (The read-write operations of the CPU are 8 or 16 bit ones, but with a 32 bit cache certain pre-reading could be done.) By selecting a good cache strategy program execution could be made largely independent of the operations taking place on the system bus.

Module Assortment

The processor module, memory module, background store coupler and communications module belong to the basic module set of the system. The module assortment of the system is being expanded constantly. The other modules available at present are an instrument interface and a local network coupler.

The Processor Module

The processor module can be broken down into the following functional subunits:

--Processing unit: a 16 bit external interface, 32 bit internal organization, 16 M byte direct access address domain, 14 addressing modes, 56 instruction types with a large number of sub-versions, five data types (bit, byte, word, double word and BCD digit), and memory mapped input/output.

--Memory organization unit, which makes possible address transformation, protection of memory segments and separation of instruction and data fields. It can contain the parameters of 32 memory segments. The size of a segment can vary between 256 bytes and 16 M bytes.

--Internal memory (EPROM-RAM): for programs supporting loading, program testing, system initiation and diagnostics.

--A 24 bit programmable counter/clock.

--Two serial lines (CCITT V.24) to connect terminals or printers with a serial interface or for a host computer connection. The line speed can be programmed in the range 50 to 19,200 bits per second.

--A programmable parallel interface. Basically it is an interface for a Centronics type printer.

--Complete system bus interface and control to provide a standard VME bus surface.

--Internal local bus interface and control.

The Memory Module

The system contains dynamic memory modules with parity protection. The capacity of one module is 512 K bytes. The address domain of the system is 16 M bytes, but the present design (number of card slots, capacity of power unit) limits the physical memory capacity to 2 M bytes, that is to four modules. The internal data organization of the memory modules is 32 bit and data can go through the system bus in 8, 16 or 32 bit widths. Thus, with direct memory access the high speed couplers can exploit the 32-bithood of the bus, thus significantly reducing the bus load. The memory reading time is 400 ns, while the writing time is 370 ns. The circuits of the memory module can also be powered from a storage battery.

The Background Store Coupler

This makes possible connection of two floppy disk and four Winchester type stores via standard peripheral interfaces. The floppy disk interface is the SA850/851 and the hard disk interface is the ST506.

The Communications Coupler

It has four independent channels. One has the option of operation with an asynchronous, byte synchronous (BSC) or bit synchronous (SDLC/HDLC) protocol. Line speed can be programmed separately by channel.

The Instrument Interface

It contains the hardware needed to control the IEEE-488 (GPIB) parallel bus.

The Local Network Coupler

This makes possible high-speed links between VT 32 computers at relatively small distances from one another (about 1 kilometer). It realizes the physical and data link layers of the Ethernet specification.

Of the developments now under way we should mention a control (graphic processor and bit-map memory) which connects to the system bus and which is suitable for handling graphic input devices and black-white and color monitors of various resolution.

Peripheral Assortment

The following peripheral assortment belongs to the VT 32 basic configuration.

Terminals

Alphanumeric or medium resolution graphic terminals can be connected to the system. The number of terminals can vary between two and six depending on the application and system structure.

Background Store

A 133 mm 720 K byte capacity floppy disk unit, a 133 mm 10-30 M byte capacity hard disk unit (a maximum of two floppy and two hard disk units can be placed in the basic mechanics).

Printer

A matrix (120 character per second) or tape printer (300-600 lines per minute) can be connected to the system.

Construction

We have designed an ergonomic set fitting an office environment. We have used the so-called "tower" design which can be placed beside a desk, a solution commonly used for similar category systems. The basic unit is suitable for accomodating the card set, the power unit and a maximum of two floppy and two hard disk units.

Basic Software

We describe below a few essential elements of the basic software of the VT 32 system.

Operating System

The USOS multi-user operating system runs on the VT 32 computer. It is compatible with the UNIX operating system used throughout the world (UNIX is a trade mark of Bell Laboratories). USOS has about 60 system calls, some of which coincide with those of UNIX; the remainder contain a few useful extensions.

Language System

We can use a number of programming languages adjusted to various applications areas under the USOS operating system. Like the operating system the great majority of the system programs are written in the "C" language. Assembler, FORTRAN, COBOL and PASCAL translator programs, in addition to the "C" language, make up the language system.

Screen-Oriented Editor

Basically this is a tool supporting correction of source language programs, but it is also suitable for simpler text editing tasks. It exploits the screen management possibilities offered by the terminals.

EXLOC Local Network Software

This is a network software system for VT 32 machines linked through an Ethernet network. It has a layer structure corresponding to the ISO OSI reference model. The "network" layer follows the appropriate protocol of the Xerox Network System (XNS). The protocols representing the "transport" and "session" layers are efficient, fast programs exploiting local network operation. Applications programs can be regarded as transparent with the network software system used.

XGKS Graphic Subsystem

This was prepared according to the prescriptions of the ISO standard. It offers the user a high level graphic interface and device independence. This substantially simplifies the writing of graphic applications programs.

Configurations, Applications

As a result of the modularity the applications of the system can be quite varied. The basic units developed in the first phase (processor, memory, background store coupler and communications coupler) together with the software produce a multi-user environment which can be used well to develop applications and run complete applications. Alphanumeric or medium resolution graphic terminals can be connected to the system through a V.24 interface. We regard the basic application here to be the solution of office or management tasks.

In the next phase of development we plan creation of a single user, high resolution graphic system by developing a graphic control connected to the system bus.

The module set supplemented by the local network coupler, and the appropriate software, offer the possibility of developing work stations and service stations (file server, printer server, multiplexer) for distributed systems.

At this time the VT 32 applications system cannot be regarded as complete, but it will gradually expand with a simultaneous raising of the service level.

A Few More Significant Applications Program Systems

Integrated Business System (IBS)

This automates a chain of office work processes which can be called typical and operates with concepts customary in offices (document, letter, case, folder, file drawer, desk, typewriter, waste basket...).

Electronic Mail System (EMIL)

This can be used on a single machine or in a multicomputer local network environment to move messages between users (mail boxes); it is a system serving administration. It offers help in composing, classifying, docketing and sending letters and in handling the incoming and outgoing "mail book."

Program packages supporting various graphic applications are under development.

VIDRA Graphic Editor

Suitable for preparation and editing of two-dimensional figures.

MAID Drive Designing System

A designing system for single or multiple stage constant transmission driving mechanisms; it designs the geared element pairs, does strength and geometric checks, selects rolling bearings and designs the axles.

RADARCH Small House Designing System

An interactive graphic designing system suitable for making blueprints of houses of at most four stories, by story.

Key to Figure:

Nyomtato=Printer
Helyi B/K=Local I/O
Helyi Mem=Local Memory
Helyi Busz=Local Bus
Rendszerbusz=System Bus
Hajl. Lemez=Floppy Disk
Meghajto=Drive
Tarolo=Storage
Helyi Halozat=Local Network

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HUNGARIAN, INTERNATIONAL RESULTS IN VLSI IN DIGITAL SIGNAL PROCESSING

Budapest MAGYAR ELEKTRONIKA in Hungarian No 1, 1986 pp 16-29

[Article by Tibor Tuzson: "VLSI in Digital Signal Processing"]

[Excerpts] Digital Signal Processing Hardware Systems

At present IC designing for digital signal processing (DSP) purposes is beginning to become one of the hottest areas of semiconductor development. The expected development of DSP structures depends on the development of VLSI technologies. More and more firms are entering the market for DSP devices. Without trying to be complete the best known of the several dozen firms are the following: Analog Devices, AMD, AT&T, Bell Laboratories, Floating Point System, Fujitsu, GEC, General Instruments, Gould-AMI, Hewlett-Packard, Hitachi, Honeywell, Hughes, IBM, Intel, International Devices Technology, ITT-Intermetall, Logic Devices, LSI Logic, Matsushita, MEDL, Motorola, Monolithic Memories, National Semiconductor, NCR, NEC, Plessey, Rockwell, RCA, STC, Texas Instruments, Toshiba, TRW, Waferscale Integration and Weitek. In addition there is hardly a university with an electric school where DSP achievements are not being reported today.

Digital signal processing products can be listed in basically seven groups:

1. General purpose, single chip digital signal processors,
2. DSP systems made up of discrete building elements,
3. Applications specific BOAK (equipment-oriented circuits) DSP systems,
4. VLSI or algorithm specific DSP devices,
5. Special purpose DSP devices,
6. Standard card level units, and
7. DSP equipment.

The present article will not deal with the last two groups. The most spectacular area is the first, thus the article will go into more detail here than for the others. Contradictory opinions appear in various professional sources, sometimes even in the same article. Thus the evaluation of the above areas reflects the opinion of the author.

Digital signal processing in the broader sense has three basic areas: digital process control (DDC, Digital Dynamic Control), digital spectrum analysis (DFT, Discrete Fourier Transform, FFT, Fast Fourier Transform) and digital signal processing in the narrower sense (DSP, Digital Signal Processing). Figure 1 shows the present status of these areas (on the basis of R. H. Cushman's "Signal Processing Tools Present Design Challenges," EDN, 13 May 81, pp 103-109, and "Signal Processing Design Awaits Digital Takeover," EDN, 24 June 81, pp 119-129). In addition to the processable analog band width and processing complexity one can find in the figure the slanting lines indicating the given processing ability (multiplications per second) and the structures or technologies belonging to these. Comparing with Cushman it can be seen that some areas have shifted in the direction of greater processing complexity and especially greater speeds. In the meantime new structures have appeared, such as systolic array processors, data-flow structures and extraordinarily fast multipliers already at the experimental level in GaAs. It can be presumed that there will soon be devices based on the Josephson effect with DSP applications as well. At the bottom of the figure one can see a line corresponding to the upper limit of analog signal processing.

Figure 2 also was prepared with new data (on the basis of Harvey J. Hindin's "Digital Signal Processing Moves Into High Gear," COMPUTER DESIGN, 15 Oct 84, Vol 23, No 12, pp 61-77). The figure is based on a 50 coefficient FIR (Finite Impulse Response) finite memory filtering algorithm and on the hypothesis that the processed analog band width corresponds to half of the sample frequency (Shannon's theorem). In addition to processing ability and band width we can find in the figure the applications and devices corresponding to them.

One can also see in the figure the DSP systems which can be made with the products, already manufactured or which can be developed, of the Microelectronics Enterprise (MEV). These include 8080, 8085 or Z80 systems made with the U400EBM. The processing ability of this approaches that of the Intel 12920 analog processor.

With the TMC2010 MAC (Multiplier Accumulator) 16x16+35 bit, NMOS, about 500 ns device in a discrete structure one can approximate the performance of the best single chip signal processors at present. The circuit is based on a macrocell implementing the MAD (Multiplier and Adder) fast multiplying algorithm. With this same basic cell one can develop a so-called IPSP (Inner Product Step Processor) device for a systolic application, TMC2161PSP. We have estimated the processing ability of these in three cases--5 micron, 3 micron one multiplier per chip and 3 micron four multipliers per chip in an NMOS version. It can be seen that as a result of using a largely parallel structure one can solve quite demanding tasks even with more modest technologies. A bit serial multiplier (SPPM, Serial Parallel Pipline Multiplier) base cell is also under development. This is outstandingly suitable for construction of high stage digital filters because one can probably realize a 24xN (N is any whole number) bit multiplier in a single chip version, which can be connected into a cascade. A further step is also possible. A BOAK signal processor (BSP) may be realized on one chip with several multipliers and auxiliary units in 3 micron

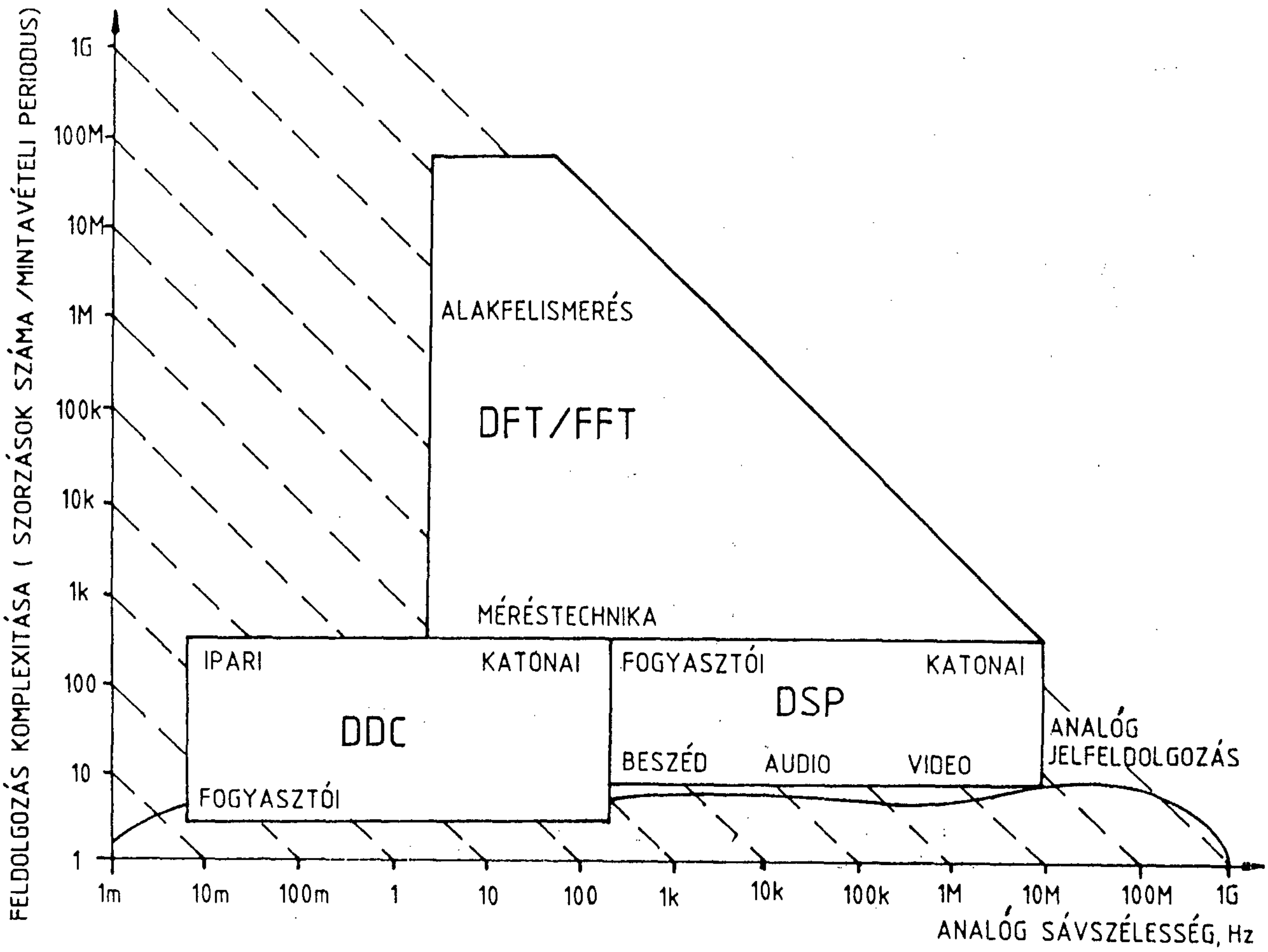
NMOS. Systolic array processors (SAP) can be built up with the SPPM and the BSP. The expected processing ability of these can be seen in the figure also. It is important to note that the type designations used in the article are not final; we are only talking about technical possibilities, which reflect the opinion of the author.

A number of smaller firms are trying to break into the DSP market gaps. One of these is Logic Devices, which manufactures a CMOS multi-port register array. This contains eight 8 bit registers which can be accessed by five parallel ports. IDT (International Devices Technology) is trying with the IDT 7202, an extraordinarily fast (50 ns) CMOS FIFO. The most significant products of Weitek are the WTL 3220, WTL 1065 and WTL 1033-10 floating point ALU's and the WTL 1064 and WTL 1032-10 floating point multipliers. The NCR firm manufactures a single port 45CN16 MAC as a peripheral for 68000 processors.

At the moment the MEV has the best chances in this area. The development of the multiplier macrocell, of the MAD, is approaching an end, so that a MAC device can be created (TMC2010MAC). If the device family needed to build up a DSP system is to be developed we would still need a sequencer, an address generator and ADC and DAC converters. The first two cause no technological problems but development of the last two will require greater efforts.

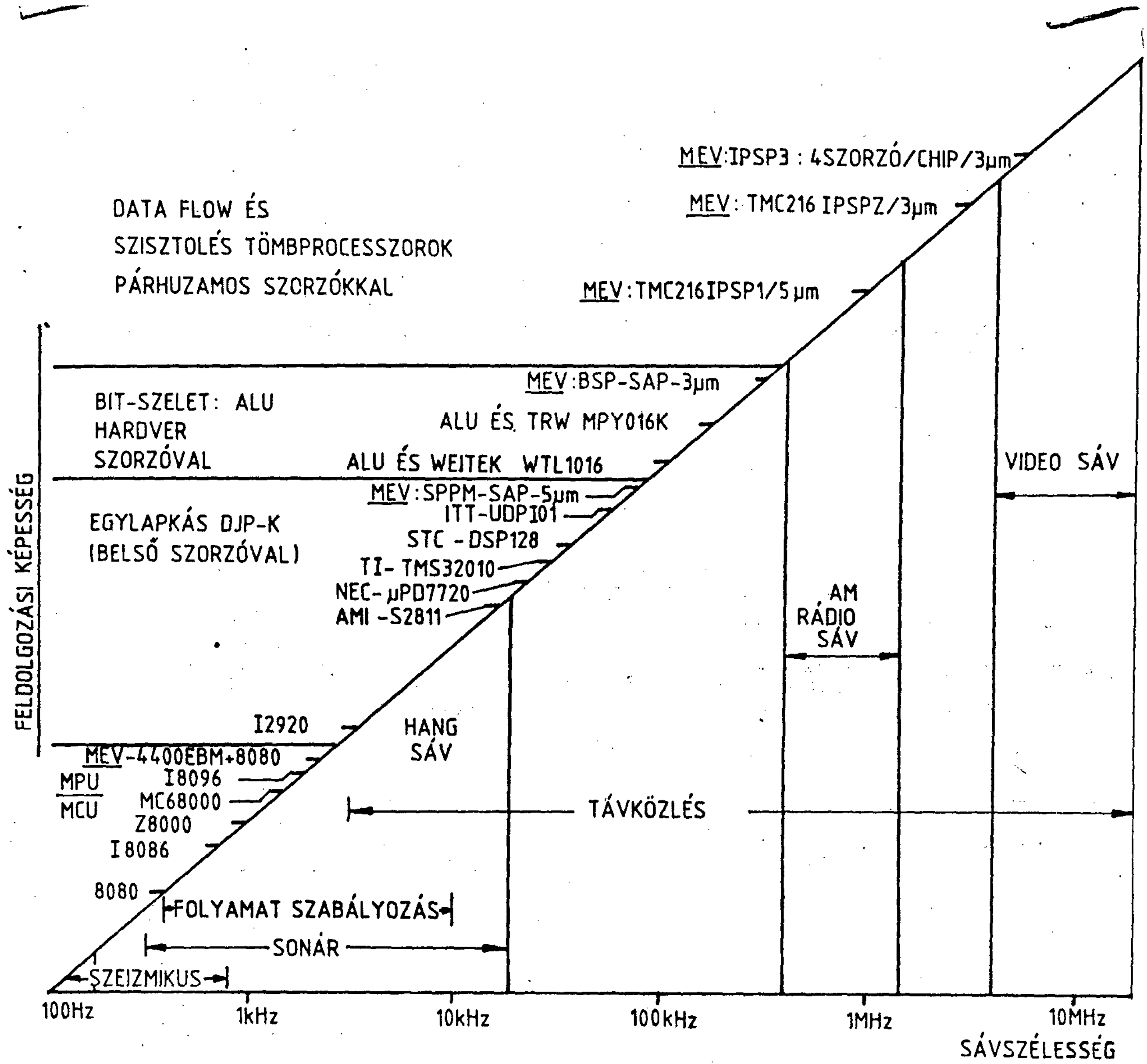
At the Microelectronics Enterprise also they are dealing with the idea of a BOAK [equipment oriented circuit, custom circuit] signal processor, a BSP. Technological progress will soon make possible development and manufacture of a programmable BOAK type device. And this will begin in the event of suitable demand. This programmability will be of a different type than we are used to for microprocessors. Every single final product will be programmable on a microprocessor type bus, so that one can choose among a few algorithms. The algorithm itself is not needed for the programming, because this is done by a reconfiguration of the hardware as a result of a command word. The user need only supply the appropriate coefficients. The BOAK character follows from the fact that one can create new products by modifying a single mask, which can realize another DSP algorithm group. The structure is bit sequential and, for example, on one chip one can select, with a command word, from among an FIR and IIR filter member, the butterfly of an FFT algorithm of the DIT and DIF type, a DFT, PARCOR or other algorithms.

Any of the parallel and bit sequential multiplier cells under development at the MEV can be developed into a systolic base circuit; indeed, such an algorithm can be implemented on the BSP device already mentioned. With the development of such a device a path is opened for building a few MHz sampling frequency signal processing systems with the existing semiconductor technology. Naturally we must pay for this with more hardware.



Key to Figure 1:

[Vertical scale] Complexity of processing (number of multiplications over sampling period)
[Horizontal scale] Analog band width, Hz
Alakfelismeres=Form recognition
Merestechnika=Measurement technology
Ipari=Industrial
Katonai=Military
Fogyasztoi=Consumer
Analog jelfeldolgozas=Analog signal processing
Beszed=Speech



Key to Figure 2:

Feldolgozasi kepesseg=Processing ability
Data flow es szisztoles tombprocesszorok parhuzamos szorzokkal=Data flow and systolic array processors with parallel multipliers
Bit-szelet: ALU hardver szorzoval=Bit slice: ALU with hardware multiplier
Hang sav=Voice band
Folyamat szabalyozas=Process control
Szeizmikus=Seismic
Tavkozles=Telecommunications
Sav=Band
Savszelesseg=Band width
MEV=the Hungarian Microelectronics Enterprise

1. táblázat A digitális jelprocesszorok jellemzői mikroelektronikai szempontok szerint

Gyártó cég:	AMI	AMI-Gould	AMI-Gould	Bell	Fujitsu	Hitachi	Hitachi
Típus:	S2811	S28211	S28212	–	MB8764	HD61810	HD61811
Elnevezés:	SPP: Signal Processing Peripheral	–	–	DSP: Digital Signal Processor	–	HSP: High-performance Digital Signal Processor	HSP-RM Evaluation Chip
Bejelentés éve:	1979 adatlap	1984	1984	1981 cikk	–	1983 cikk	1984 cikk
Technológia:	VMOS	–	–	NMOS	CMOS	CMOS	SMOS
Jellemző méret (μm):	–	–	–	4,5	–	3	3
Komplexitás:							
– tranzisztorsz.	30 500	–	–	45 000	–	55 000	–
– kapuszám:	–	–	–	–	–	–	–
Lapkaméret (mm²):	25	–	–	68	–	49	–
Tápfeszültség (V):	5	–	–	5	5	5	5
Fogyasztás (W):	1	–	–	1,5	0,3	0,25	–
Utasításciklus:	300	–	–	800	100	250	–
Órafrekvencia (MHz):	20	–	–	5	10	16	–
Lábszám:	28	–	–	40	88	40	68
Tokozás:	DIL	–	–	–	PGA	DIP	PGA
Ár ($/db/év):	–	121/100/83	121/100/83	–	100/– /85–		–
Másodgyártó:	–	Japán, USA tervezett	Japán, USA tervezett	–	–	–	–

Gyártó cég:	IBM	Intel	Intel	ITT-Intermetall	ITT-Intermetall	ITT-Intermetall
Típus:	–	I2920–16/ I2920–18	I2921	MAA1000	UDPI01	UDPI01–EC
Elnevezés:	RSP: Real-time Signal Processor	Analog Processor	Analog Processor	–	UDPI: Universal Digital Signal Processor	Evalution Chip
Bejelentés éve:	1983 cikk	1980 adatlap	1980 adatlap	– –	1983/1985 cikk/adatlap	1985 adatlap
Technológia:	NMOS	NMOS	NMOS	NMOS	CMOS/HMOS	CMOS
Jellemző méret (μm)	2	4,5	4,5	–	3/2,4	2,4
Komplexitás:						
– tranzisztorsz.:	–	30 000	30 000	–	–	–
– kapuszám:	15 000	–	–	–	–	–
Lapkaméret (mm²):	58	29	29	–	30	–
Tápfeszültség (V):	–	+5/–5	+5/–5	5	5	5
Fogyasztás (W):	2,5	0,8	0,8	–	0,08	0,08
Utasításciklus:	200	600/800	400	250	100	100
Órafrekvencia (MHz):	–	6,67/5	10	–	20	20
Lábszám:	171	28	28	–	40	–
Tokozás:	–	DIP	DIP	–	DIL	DIL
Ár ($/db/év):	–	50/100/83	20/10k/83	–	–	–
Másodgyártó:	–	–	–	–	–	–

Gyártó cég:	NEC	NEC	NEC	STC	Texas Instruments	Texas Instruments
Típus:	μPD7720	μPD77P20	–	DSP128	TMS32010	TMS320M10
Elnevezés:	SPI: Signal Processing Interface	SPI: Signal Processing Interface	FSP: Floating Point Signal Processor	CRISP: Cascadable Real-Time Integrated Signal Processor	–	–
Bejelentés éve:	1981 adatlap	1981 adatlap	1984 cikk	1985 cikk	1982 adatlap	1982 adatlap
Technológia:	NMOS/HMOS	NMOS	CMOS	NMOS	NMOS	NMOS
Jellemző méret (μm)	2,5–3	2,5–3	2,5–3	3	2,7–3	2,7–3
Komlpexitás:						
– tranzisztorsz.:	40 000	–	110 000	90 000	–	–
– kapuszám:	–	–	–	–	–	–
Lapkaméret (mm²):	28	–	144	–	36	–
Tápfeszültség (V):	5	5	–	–	5	5
Fogyasztás (W):	1,5	1,5	1	–	0,95	0,95
Utasításciklus:	250	250	294	320	200	200
Órafrekvencia (MHz):	8	8	24	12,5	20	20
Lábszám:	28	28	132	68	40	40
Tokozás:	DIP	DIP	–	ICC	DIP	DIP
Ár ($/db/év):	64/1k/83	175/1k/84	–	–	120/100/83	120/100/83
Másodgyártó:	AMI terv	AMI terv	–	–	General Instruments CMOS változat	General Instruments CMOS változat

Key to Table 1: Characteristics of digital signal processors according to microelectronic parameters [List of left column data types; Hungarian words appearing in rows are in parentheses.]

Manufacturing firm
Type
Designation
Year reported (adatlap=data sheet; cikk=article)
Technology
Characteristic dimension, in microns
Complexity:
  Number of transistors
  Number of gates
Chip size, in square mm
Power voltage, V
Consumption, W
Instruction cycle
Clock frequency, MHz
Pin number
Encapsulation
Price--dollars, units, year
Secondary manufacturer (tervezett=planned; terv=plan; valtozat=version)

2. táblázat A digitális jelprocesszorok jellemzői hardver szempontok szerint

Típus:	S2811	S28211	S28212	DSP	MB8764	HD61810	HD61811
Műveletvégző rész:							
Szorzó:	HW/fixp.	HW/fixp.	HW/fixp.	HW/fixp.	HW/fixp.	HW/ lebp.+ fixp.	HW/ lebp.+ fixp.
– algoritmus:	–	–	–	–	Booth	–	–
– bitszám:	12x12=16	12x12=16	12x12=16	20x16=36	16x16=26	(12+4)x x(12+4)= 16+4	(12+4)x x(12+4)= 16+4
– idő (ns):	300	300	300	800	100	250	250
– sebesség (MHz):	–	–	–	–	10	–	–
ALU (bit):	16	–	–	40	26	16+4	16+4
Jelzőbitek (bit):	5	–	–	–	–	5	5
Akkumulátor (bit):	16	–	–	40	26	2x(16+4)	2x(16+4)
Tárolóegységek a lapkán:							
Adat RAM (bit):	128x16=2048	128x16=2048	128x16=2048	128x20=2560	2x128x16= 4096	200x16= 3200	200x16= 3200
Együttható:							
– ROM (bit):	128x16=2048	128x16=2048	128x16=2048	–	–	128x16= 2048	–
– RAM (bit):	–	–	–	–	–	–	128x16= 2048
Utasítás:							
– ROM (bit):	256x17=4352	512x17=8704	–	–	–	512x22= 11264	–
– RAM (bit):	–	–	–	–	–	–	512x22= 11264
Utasítás és együttható ROM (bit):	össz. 6300	össz. 10752	össz. 2048	1024x16= 16384	1024x24= 24576	össz: 13312	–
EPROM változat:	nincs	nincs	nincs	nincs	nincs	nincs	nincs
Külső címezhető tárak:							
Tárolóegység (bit):	–	–	–	1024x16= 16384	–	–	–
Utasítástár (ROM) (bit):	–	–	512x17=9704	–	1024x24= 24976	–	–
Adattár (RAM) (bit):	–	–	–	–	1024x16= 16384	–	–
Külső adatforgalom:							
Soros bemenet (db):	1	1	1	1	–	1	1
Soros kimenet (db):	1	1	1	1	–	1	1
Soros B/K sebessége (MHz):	–	–	–	–	–	–	–
Párhuzamos B/K (bit):	8	8	8	16	16	8/16	8/16
Analóg B (db/bit):	–	–	–	–	–	–	–
Analóg K (db/bit):	–	–	–	–	–	–	–
DMA:	–	–	–	–	van	van	van
Belső adatforgalom:							
Címsín (bit):	8	–	–	10	–	–	–
Programsín (bit):	17	–	–	20	–	22	22
Adatsín (dbxbit):	2x16	–	–	1x20	–	16	16
Hurokszámláló (dbxbit):	1x5	1x5	1x5	1x6	–	1x6	1x6
Cím aritmetikai egység (dbxbit):	–	–	–	1x10	1x7+1x8	–	–

Típus:	RSP	I2920-16 I2920-18	I2921	MAA1000	UDPI01	UDPI01-EC
Műveletvégző rész:						
Szorzó:	SW	SW	SW	HW/fixp.	HW/fixp.	HW/fixp.
– algoritmus:	–	–	–	–	Booth	–
– bitszám:	–	≈25	≈25	16x8	16x16=31	16x16=31
– idő (ns):	–	–	–	–	200 (MAC)	200(MAC)
– sebesség (MHz):	–	–	–	–	–	–
ALU (bit):	32	25	25	–	31	31
Jelzőbitek (bit):	5	–	–	–	–	–
Akkumulátor (bit):	32	–	–	–	2x31	2x31
Tárolóegységek a lapkán:						
Adat RAM (bit):	–	40x25=1000	40x25=1000	128x28=3584	2x220x16=7040	2x220x16=7040
Együttható:						
– ROM (bit):	–	16x4=64	16x4=64	128x8=1024	2x36x16= 1152	–
– RAM (bit):	–	–	–	32x8=256		–
Utasítás:						
– ROM (bit):	–	194x24=4656	194x24=4656	512x26=13312	1024x16=16384	–
– RAM (bit):	–	–	–	–	–	–
Utasítás és együttható ROM (bit):	–	össz. 4720	össz. 4720	össz. 14336	össz. 17536	–
EPROM változat:	nincs	igen	I2920	igen	nincs	nincs
Külső címezhető tárak:						
Tárolóegység (bit):	–	–	–	–	–	–
Utasítástár (ROM) (bit):	65536x24= 1572864	–	–	–	–	–

Adattár (RAM) (bit):	65536x16= 1048576	–	–	–	–	
Külső adatforgalom:						
Soros bemenet (db):	–	–	–	–	2	2
Soros kimenet (db):	–	8/1 bit	8/1 bit	–	2	2
Soros B/K sebessége (MHz):	–	–	–	–	5/1	5/1
Párhuzamos B/K (bit):	–	–	–	–	16	16
Analóg B (db/bit):	–	4/9	4/9	–	–	–
Analóg K (db/bit):	–	8/9	8/9	–	–	–
DMA:	–	–	–	–	–	–
Belső adatforgalom:						
Címsín (bit):	–	–	–	–	8	8
Programsín (bit):	24	24	24	–	10	10
Adatsín (dbxbit):	16	25	25	–	2x16	2x16
Hurokszámláló (dbxbit):	–	–	–	–	4x8	4x8
Cím aritmetikai egység (dbxbit):	van	–	–	–	(2x5)x8	(2x5)x8

Tipus:	µPD7720	µPD77P20	FSP	DSP128	TMS32010	TMS320M10
Müveletvégző rész:						
Szorzó:	HW/fixp.	HW/fixp.	HW/lebp.	HW/fixp.	HW/fixp.	HW/fixp.
– algoritmus:	–	–	–	–	–	–
– bitszám:	16x16= 32	16x16= 32	(16+ 6)x(16+ 6)= 16+ 6	16x16= 32	16x16= 32	16x16= 32
– idő (ns):	250	250	–	–	200	200
– sebesség (MHz):	–	–	–	–	–	–
ALU (bit):	16	16	16+ 6	35	32	32
Jelzőbitek (bit):	12	12	–	3	4	4
Akkumulátor (bit):	2x16	2x16	–	35	32	32
Tárolóegységek a lapkán:						
Adat RAM (bit):	128x16= 2048	128x16= 2048	2x16x22= 704	2x256x16= 8196	144x16= 2304	144x16= 2304
Együttható:						
– ROM (bit):	128x16= 2048	128x16= 2048	–	–	–	–
– RAM (bit):	–	–	–	–	–	–
Utasitás:						
– ROM (bit):	512x23= 11776	512x23= 11776	512x30= 15360	–	–	1536x16= 24416
– RAM (bit):	–	–	128x30= 3840	–	–	–
Utasitás és együttható ROM (bit):	össz. 13824	össz. 13824	össz. 15360	–	–	össz. 24416
EPROM változat:	µPD77P20	igen	nincs	–	nincs	nincs
Külső címezhető tárak:						
Tárolóegység (bit):	–	–	524288x22= 11536336	65536x8= 524288	4096x16= 65536	2560/4096x16
Utasitástár (ROM) (bit):	–	–	–	–	–	–
Adattár (RAM) (bit):	–	–	–	–	–	–
Külső adatforgalom:						
Soros bemenet (db):	1	1	4	–	–	–
Soros kimenet (db):	1	1	4	–	–	–
Soros B/K sebessége (MHz):	2	2	6,8	–	–	–
Párhuzamos B/K (bit):	8	8	(16+ 6)B+ (16+ 6)K	8	16	16
Analóg B (db/bit):	–	–	–	–	–	–
Analóg K (db/bit):	–	–	–	–	–	–
DMA:	van	van	–	van	–	–
Belső adatforgalom:						
Címsín (bit):	–	–	–	–	–	–
Programsín (bit):	–	–	30	8	16	16
Adatsín (dbxbit):	–	–	3x(16+ 6)	16	16	16
Hurokszámláló (dbxbit):	–	–	1 db	2x8	–	–
Cím aritmetikai egység (dbxbit):	–	–	–	2	–	–

3. táblázat A digitális jelprocesszorok jellemzői szoftver szempontok szerint

Tipus:	S2811	S28211	S28212	DSP	MB8764	HD61810	HD61811
Slave üzemmód:	6800	6800	6800	–	–	6800/68000	6800/68000
Önálló üzemmód:	igen	–	–	igen	–	igen	igen
Reset:	van	van	van	van	van	1	1
Megszakítás:	–	–	–	–	–	1	1
Felt. nélk. ugrás:	2	–	–	–	1	–	–
Feltételes ugrás:	8	–	–	–	van	–	–
Szubrutinszintek:	1	1	1	1	1	2	2
Dinamikatartomány (bit):	16	16	16	20	16	32	32
Felbontóképesség (bit):	16	16	16	20	16	12	12
Adat szóhossz (bit):	16	16	16	20	16	16	16
Együtthatószóhossz (bit):	16	16	16	16	16	16	16
Utasitás szóhossz (bit):	17	17	17	16	24	22	22
Alkalmazási jellemzők:							

IIR (μs/fokszám):	–	2,1/2	2,1/2	–	–	–	–
FIR (μs/fokszám):	–	–	–	–	–	–	–
FFT:							
– valós (ms/pont):	1,5/64	–	–	–	–	–	–
– komplex (ms/pont):	1,5/42	0,4/32	–	–	–	–	–
LPC-PARCOR:	–	–	–	–	–	azonos idejű /2 IC	azonos idejű /2 IC
Fejlesztő eszközök:							
Fejlesztő rendszer:							
– típus:	–	–	–	–	–	–	–
– ár ($):	–	–	–	–	–	–	–
Simulátor:							
– típus:	–	SSPP28211	SSPP28211	–	–	–	–
– host:	–	–	–	–	–	–	–
– operációs rendszer:	–	–	–	–	–	–	–
– ár ($):	–	–	–	–	–	–	–
Assembler:							
– típus:	–	–	–	–	–	Crossassembler	Crossassembler
– host:	–	–	–	–	–	–	–
– operációs rendszer:	–	–	–	–	–	–	–
– ár ($):	–	–	–	–	–	–	–
EPROM programozó:	–	–	–	–	–	–	–
In-circuit emulátor:							
– típus:	RTDS2811	RTDS28211	RTDS28211	–	–	–	emulator
– ár ($):	–	20 000	20 000	–	–	–	–

Típus:	RSP	I2920	I2921	MAA1000	UDPI01	UDPI01-EC
Slave üzemmód:	–	–	–	–	68000	68000
Önálló üzemmód:	igen	igen	igen	–	igen	igen
Reset:	–	1	1	–	1	1
Megszakítás:	–	–	–	–	–	–
Felt. nélk. ugrás:	–	EOP	EOP	–	1	1
Feltételes ugrás:	–	–	–	–	10	10
Szubrutinszintek:	–	–	–	–	4	4
Dinamikatartomány (bit):	16	25	25	16	16	16
Felbontóképesség (bit):	16	9	9	16	16	16
Adat szóhossz (bit):	16	25	25	16	16	16
Együttható szóhossz (bit):	16	4–25	4–25	8	16	16
Utasítás szóhossz (bit):	24	24	24	–	16	16
Alkalmazási jellemzők:						
IIR (μs/fokszám):	–	–	–	–	1,2/2	–
FIR (μs/fokszám):	–	–	–	–	20,1/100	–
FFT:						
– valós (ms/pont):	40/1008	–	–	–	–	–
– komplex (ms/pont):	–	–	–	–	0,424/64	–
LPC-PARCOR:	–	–	–	–	–	–
Fejlesztő eszközök:						
Fejlesztő rendszer:						
– típus:	–	MC1–20–DS1 SDK 2920	MC1–20–DS1 SDK 2920	–	–	–
– ár ($):	–	21 400 995	21 400 995	–	–	–
Simulátor:						
– típus:	Simulator	MCI–20–SPS	MCI–20–SPS	–	Simulator	Simulator
– host:	–	–	–	–	DEC	DEC
– operációs rendszer:	–	–	–	–	–	–
– ár ($):	–	4200	4200	–	–	–
Assembler:						
– típus:	Assembler	MCI–20–SPS	MCI–20–SPS	–	Crossassembler	Crossassembler
– host:	–	–	–	–	DEC	DEC
– operációs rendszer:	–	–	–	–	–	–
– ár ($):	–	4200	4200	–	–	–
EPROM programozó:	–	van	–	–	–	–
In-circuit emulátor:						
– típus:	–	–	–	–	van	van
– ár ($):	–	–	–	–	–	–

Típus:	μPD7720	μPD77P20	FSP	DSP128	TMS32010	TMS320M10
Slave üzemmód:	8080/85,Z80	8080/85,Z80	–	–	–	–
Önálló üzemmód:	igen	igen	igen	igen	igen	igen
Reset:	1	1	–	–	1	1
Megszakítás:	1	1	–	0	1	1
Felt. nélk. ugrás:	1	1	–	–	1	1
Feltételes ugrás:	32	32	–	–	10	10
Szubrutinszintek:	4	4	–	8	4	4
Dinamikatartomány (bit):	16	16	64	16	16	16
Felbontóképesség (bit):	16	16	16	16	16	16
Adat szóhossz (bit):	16	16	22	16	16	16

Együttható szóhossz (bit):	13	13	22	16	16	16
Utasítás szóhossz (bit):	23	23	30	–	16	16
Alkalmazási jellemzők:						
IIR (μs/fokszám):	2,25/2	–	–	1,92/2	–	–
FIR (μs/fokszám):	–	–	–	66/200	–	–
FFT:						
– valós (ms/pont):	0,7/32	–	–	–	–	–
– komplex (ms/pont):	1,6/64	–	–	1,5/64	–	–
LPC-PARCOR:	–	–	–	–	–	–
Fejlesztő eszközök:						
Fejlesztő rendszer:						
– típus:	EVAKIT7720	EVAKIT7720	–	–	XDS, EVM	XDS, EVM
– ár ($):	5000	5000	–	–	5000, 1000	5000, 1000
Simulátor:						
– típus:	Simulator	Simulator	–	Simulator	–	–
– host:	INTELEC II	INTELEC II	–	VAX 11, PC	–	–
– operációs rendszer:	ISIS II	ISIS II	–	–	–	–
– ár ($):	1500	1500	–	–	–	–
Assembler:						
– típus:	Macrocross-assembler	Macrocross-assembler	–	Crossassembler	–	–
– host:	INTELEC II	INTELEC II	–	VAX 11, PC	–	–
– operációs rendszer:	ISIS II	ISIS II	–	–	–	–
– ár ($):	1500	1500	–	–	–	–
EPROM programozó:	–	EVAKIT7720	–	–	XDS, EVM	XDS, EVM
In-circiut emulátor:						
– típus:	–	–	–	ICE	XDS, EVM	XDS, EVM
– ár ($):	–	–	–	–	–	–

Key to Table 2: Characteristics of digital signal processors according to hardware parameters [List of left column data types; Hungarian words appearing in rows are in parentheses.]

Type
Part performing operation
Multiplier:
--algorithm
--bit number
--time, ns
--speed, MHz
ALU, bit
Indicator bits, bit
Accumulator, bit
Storage units on chip:
Data RAM, bit
Coefficient:
--ROM, bit
--RAM, bit
Instruction:
--ROM, bit
--RAM, bit
Instruction and coefficient ROM, bit (ossz=total)
EPROM version (nincs=has none; igen=yes)
External addressable stores
Storage unit, bit
Instruction store, ROM, bit
Data store, RAM, bit
External data traffic
Serial input, each
Serial output, each
Speed of serial I/O, MHz
Parallel I/O, bit
Analog input, each/bit
Analog output, each/bit
DMA (van=has)
Internal data traffic
Address bus, bit
Program bus, bit
Data bus, each x bit
Loop counter, each x bit
Address arithmetic unit, each x bit

Key to Table 3: Characteristics of digital signal processors according to software parameters [List of left column data types; Hungarian words appearing in rows are in parentheses.]

Type
Slave operation
Independent operation (igen=yes)
Reset (van=has)
Interrupt

Unconditional jump
Conditional jump
Subroutine levels
Dynamic domain, bit
Resolution, bit
Data word length, bit
Coefficient word length, bit
Instruction word length, bit
Applications characteristics:
IIR, microseconds/order of equation
FIR, microseconds/order of equation
FFT:
--real, ms/point
--complex, ms/point
LPC-PARCOR (azonos ideju=same time)
Developmental tools
Developmental system:
--type
--price, dollars
Simulator:
--type
--host
--operating system
--price, dollars
Assembler:
--type
--host
--operating system
--price, dollars
EPROM programming (van=has)
In-circuit emulator:
--type (van=has)
--price, dollars

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CSO: 2502/28

EAST EUROPE/MICROELECTRONICS

HUNGARIAN OPTICAL WORKS OFFICIAL ON MOMCOLOR DEVICE

Budapest MAGYAR ELEKTRONIKA in Hungarian No 1, 1986 pp 81-82

[Interview with Gyula Lukacs, leading designer of the MOM (Hungarian Optical Works) laboratory instruments department: "We Have Only One Question"]

[Text] [Question] You have devoted your professional life to color measurement. The latest event and summation of this was defense of the candidate's dissertation. What is tristimulus colorimetry and what sort of electronic and metrological problems did you have to solve in connection with it?

[Answer] The colors of our natural environment, works of art and successful industrial products bring us much beauty. Seeing color is a complex brain activity; we still do not know the details, the precise process. The result of seeing color, the sense of color, is influenced by many personal differences and by external circumstances (the light source, the level of illumination, the structure of the colored object and its environment, etc.). Despite the individual differences in our perception of color we are all the same in that we cannot give numerical values to the three properties of colored objects--hue, saturation and brightness. And yet we can distinguish very small differences between two colors seen side by side or between a color seen and one remembered. In practice the debate is always about the color difference between colored objects: Is the color difference seen acceptable or not? We call the permissible color difference the color tolerance. The vendor would always like a larger color tolerance, the customer would like a smaller one. As long as we study the question visually we can argue a lot about color tolerance. Instrumental colorimetry solves this problem.

Color perception depends on so many factors and influencing quantities that we cannot model it. We can come to a solution of the problem with a simplified seeing of color. Then the observer attends to only a very small field of vision, two degrees; this could be a circle divided in two with the color to be studied in one half while the color in the other half can be adjusted by the observer by changing the ratio and intensity of three colored lights--appropriately selected--until the two parts of the field of vision appear completely uniform. We call this simplified (reduced) color perception a color stimulus; we can model this and work out a measurement method which we call color stimulus measurement. An international prescription for color stimulus measurement determines the light source, the sensitivity of a human eye accepted as average, the white reference standard (which is the base point for our perception of color), and the method of perception, for example that the illumination should fall perpendicularly on the plane of the object and that the direction of observation makes a 45 degree angle with it.

In the colorimetry instrument there is--using a schematic approach--a lamp illuminating the object, a unit to determine the spectral distribution of the radiation reflected from the object being studied and the sensor (a selenium or, more recently, silicon light cell). The spectral sensitivity of the latter must be adjusted to the eye sensitivity accepted as average (for example, with a combination of filters). The spectral distribution necessary here, between 380 and 780 nm, can be determined with a spectrophotometer or broad transmission filters. If we use four filters then we talk of tristimulus colorimetry (one curve transmits in two ranges so two filters are needed for this). Tristimulus colorimeters are simpler than the spectrophotometer solutions, and cost only a tenth as much. Tristimulus colorimeters are the routine color measurement tools for industry; in stability they approach the spectrophotometers, and their precision is satisfactory.

We made the first domestic tristimulus colorimeter at the Measurement Technology Central Research Laboratory in 1968. The Hungarian Optical Works has been manufacturing it ever since, in further developed models, the only plant to do so in the CEMA countries. Thus far they have sold about 800 of the MOMCOLOR instruments, most of them abroad. Series manufacture of the MOMCOLOR-100 begins this year; it contains a computer they developed themselves.

Tristimulus colorimeters are relatively simple. Selection of suitable sensors caused a problem because the spectral sensitivity of different selenium light elements--we found--does not change uniformly with temperature. Finding a suitable type at the English Megatron we were able to build a precise instrument even without thermosization.

One of the unique aspects of color stimulus measurement is that--as we characterize color perception with three properties--the color stimulus is determined by three numbers, so it is a three-dimensional quantity. The other thing which must be noted is that we must start from the difference between two colors, in accordance with human perception. The short term stability of the colorimetry instrument, which I call the colorimetry repeatability, can be interpreted unambiguously, and in a manner understandable to the user, by the color stimulus difference Delta E*ab. One point in the a*b*L* color stimulus space belongs to each color. Spheres surrounding the points determine the uncertainty of the measurement; these spheres are larger for dark and saturated samples and smaller for light and less saturated ones.

Finally, I had to turn much attention to solving applications technology problems. They do not teach colorimetry anywhere. In recent years this has been done in some universities and colleges in the form of a special collegium.

I might summarize the general lesson of my achievements thus far like this: When introducing a new measurement method it is not enough to make a good, competitive new instrument; one must also define the metrological characteristics of the measurement or method. If these do not yet exist in international practice then one must deal with this by propagating information, with personal consultations and organizing the issuing of publications. Only in this way can one arouse broad domestic and foreign interest and gather a circle of customers. And behind all this there must be many scientific efforts and achievements.

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HUNGARIAN COMPUTER ENGINEERING SURVEY

Budapest MAGYAR ELEKTRONIKA in Hungarian No 1, 1986 pp 82-85

[Article by Zoltan Tompe: "Dispute: Small Hungarian Computer Engineering--Or The Findings of a Survey"]

[Text] On a commission from the OMFB [National Technical Development Committee] the National Market Research Institute conducted a broad survey concerning factors hindering a faster spread of computer technology and the alternatives for a possible solution. Workers from the institute interviewed 50 experts personally and an additional 144 experts answered the questions by filling out questionnaires. The 194 experts made a total of 384 recommendations. We will summarize below the more important findings of the study, noting that a professional debate and evaluation of the material remains to be done.

In the opinion of those questioned we are behind the capitalist world market in computer technology by 12 years. We are behind the United States by 15 years and behind Western Europe by 8 years. In the case of microcomputers the experts estimate this at an average of 4-5 years.

We were interested in how those questioned viewed the Hungarian computer technology price level in comparison to the capitalist world market price level. We found a very great spread in the answers. Some considered the domestic prices higher by 20-30 percent, others spoke of a 15 or 20 fold difference. The average gave a price difference of 4-4.5 times. The answers regarding the foreign exchange multipliers reflect emotions, attitudes, goals and hidden intentions. It was characteristic that those working in the area of using computers mentioned multipliers of 5-10-20 times while according to the manufacturing enterprises and the National Material and Price Office, working with their documentation, the price difference is 2.5 times. Many would not speak in terms of years and foreign exchange multipliers because our backwardness is of a qualitative character, the content of which is different and not simply a distance which can be measured in years. Data of this type are of only journalistic interest.

The majority of the experts feel that Hungarian computer technology represents the front line for CEMA. According to some we hardly have a substantive advantage, the advantage being limited to formal appearance, nice prospectuses and, in some cases, somewhat better service for customers. Our CEMA advantage is doubted primarily in the areas of research and development and instruction, and the opinion of the manufacturers is regarded as harmfully cocksure.

Price Increasing Factors

A special chapter in the study deals with why Hungarian computer technology products are so expensive. The overwhelming majority of the respondents named the difficulties of material and parts supply, the high parts prices and acquisition problems as the most important price increasing factors. Only those representing parts manufacture and the price control authorities were of a contrary opinion. According to them the parts cost in computer technology products is only a fraction, a maximum of 30 percent. In such a small ratio the parts prices cannot justify the great price difference.

In contrast to this the equipment manufacturers prove with concrete calculations the effect of high parts prices and the ripple effects of them. Parts made domestically or in socialist countries are 2-4 times, sometimes 10 times, higher. The price structure of western import parts is such that a western equipment manufacturer gets parts for an average of 70 percent of the Hungarian free-border price. A Hungarian equipment manufacturer gets the same part for 130 percent of the free-border price. So 130 as opposed to 70 means almost double the price. Because of the lack of a value added reserve the high parts prices have a ripple effect on all the other cost factors, because the projection base for every payment obligation of a tax character is the total production value and not only the added value.

Seeking deeper causes the monopoly situation of manufacturing enterprises and vendors was named as a seriously damaging circumstance. One has to be "in good" with these monopolies if the user wants to get the needed parts in a foreseeable time and in sufficient quantities.

In second place, after parts supply, among the difficulties of hardware manufacture is the regulatory environment. In the opinion of the experts the present regulations do not permit the manufacturing enterprises even a dynamic maintenance of level. The extraordinarily high taxes, payment obligations and withdrawals run counter to price reductions and make natural selection impossible. Areas worthy of it do not get the redistributed assets, "the peaks are thrown into the hollows." Professional public opinion is extraordinarily heated and irritated because of the present magnitude of central withdrawals.

The vigorous restraint on investment, in its fifth year, causes serious damage to the domestic computer engineering manufacturing industry. In such a dynamic branch, where some manufacturers appear with a new product generation every 3 years, the 5 years stagnation represents a virtually unrecoverable lag or disadvantage. If we had been producing at the world level in 1980, and then hardly did anything for 5 years, even then we could hardly speak of what the technology, completely modern earlier, was worth....

Financial regulation is not adjusted to the specifics of computer technology. The present categorization and financial prescriptions pertaining to computer technology are anachronistic and serious obstacles to development. High duties are still one of the obstacles to reducing the price level. Our duties policy protects the backwardness of the country. Those who want to bring modern parts and world level technology into the country are severely punished. The frequent changes in the regulatory system also cause many problems, primarily in planning. The regulators change several times within the life cycle of a product and the economic conditions can change radically in a way which cannot be calculated in advance. It is very difficult to plan business policy under such circumstances.

The payment obligations in the domestic economic regulatory system are primarily assets-proportional. Although there has been some movement from this already we can still say that the burdens are still much more assets proportional than wage-proportional. And computer technology is a branch which uses relatively many and expensive assets, and less live work.

It must be noted, however, that the manufacturing enterprises cannot be completely exonerated of responsibility for the high price level. They have been spoiled by the shortage economy, their primary interest is a shortage market with a high price level and maintenance of the convenient monopoly situation. They complain, but they get excellent profits without any special effort.

Patents--At Any Price

According to the experts the biggest problem for technical development is that there is no market feedback. We have not yet found an interest mechanism in which the developer can see what economic profit his work has, the extent to which his product is marketable. Developmental capacities are extraordinarily dispersed, there is much parallel development. Coordination is bad among developmental institutes, even not rarely within institutes. The enterprises are interested only in the annual profit level, little interested in long-range development. So there is a lack of long-range thinking following from enterprise interest, which depresses primarily the developmental areas.

Developmental tools are constantly becoming obsolete, there is no money to replace or renew them. There is little money to encourage development or even to subsidize outstanding developmental activity. Finally, the acute capital shortage hinders the realization of developments, putting them into production.

To a significant degree our technical development attitude differs from the attitude of our world market competitors. Here much more money can be earned from a patent than from wages. The developer is interested in finding some entirely new solution which can then be patented. Even an enterprise cannot really pay for a product idea or organizational procedure representing a truly outstanding market success unless it is attached to some sort of patent. So the developers force new solutions even if this has no market or other rationality. Electronics offers virtually a hundred different solution possibilities for the same thing and it is in the material interest of the developers to bring out new ones different from one another and not compatible with one another, even if obviously unmarketable, unmanufacturable or even irrational. This is how an offering of more than 100 types of domestic microcomputers developed. This is why virtually every Hungarian manufacturer and product has its own standards, which causes confusion even on the Hungarian scale and is simply unmarketable internationally.

The separation of the research-development-manufacture process is unjustified between development and manufacture, for these two are interlocking concepts. We speak of research and development, and of manufacture separately. It would be more justified to speak of development and manufacture, and of research separately. Research belongs in the research institutes, and development in the factories. Development is inseparable from manufacture, for it must be based on a manufacturing technology. If development and manufacture do not take place in the same organization then we are forced to take 1-3 years to adopt the product.

The fact that a significant part of the manufacturing tools are already amortized causes a serious problem in two respects. On the one hand it indicates that the tools for computer engineering manufacture are obsolete, and modern products cannot be manufactured with obsolete tools. The large number of assets written off to zero is also a big problem because there is no possibility for reassessment, and amortization cannot be generated on the old, obsolete machines still in use, which would help technical development and even acquisition of new machines.

Although a few observed that there is no special problem with our manufacturing technology or the modernness of our plants, it was the opinion of the majority that our technology is backward. Many referred to our computer engineering manufacture as being at the manual level, shop work, not really manufacturing.

In connection with the manpower situation most noted that there is no adequate material or moral recognition. The underpay of the technical intelligentsia is having an increasingly negative effect in computer technology. A mechanism of contraselection has begun; only the less talented, less valuable people choose technical careers. One of the most definite manifestations of this is that the economic work associations, partnerships and small cooperatives are drawing the most valuable work force away from the large enterprises. Instead of developing a system program for capitalist export an outstanding software expert will be writing wage accounting programs for a producer cooperative on a Commodore-64 computer, because he can get at least five times the money for it.

The Best and The Worst

The opinion of the experts was virtually unanimous that one can find many well trained software engineers in Hungary. But the outstanding experts, who could compete even internationally, are only the tip of the iceberg. There is an extraordinarily great spread in regard to the professional training of software people. The domestic expert staff showing a few outstanding talents is not truly successful here at home. We found opinions according to which

Hungarian software in general is at the world level, but we also found opinions according to which our apparent successes thus far are only game programs blown up by the press.

In regard to our capitalist relationship export activity we are only selling cheap and good manpower, not the achievements of this manpower. The experts employed at a cut rate leave the results of their work in the West. Many called this type of export nigger work or slavery.

Domestic software supply is not satisfactory in either quality or quantity. Few programs are prepared and custom developments are characteristic. Every user orders a separate custom program and will not accept standard programs. Indeed, the software manufacturer also seeks and encourages custom orders. A dread of ready-made products is a typical Hungarian economic attribute. The small economic work associations formed recently in the hundreds have given life to the software market, have forced prices down somewhat, have created a competition situation and are successful, so their role is unambiguously positive. But the production of software is disorganized, uncoordinated and has a small operation character. There is very much parallel development, forces are scattered, it is impossible to know where something is being worked on or where it is ready. The unrealistically high software prices hold back the spread of computer technology.

Software writing is a science which has laws, internal interdependencies which can be well codified, studied, further developed and discovered. It is no exaggeration to speak already of a software manufacturing technology. But here the most modern technologies of software manufacture have been mastered only at a rudimentary level and few know the internal laws of software writing. The documentation of software products is bad. A program is brilliant in vain if one cannot know what it can do, if we do not know how it must be used, if we cannot modify it. It is to be feared that with the appearance of microcomputers the camp of software writers will be diluted further. Masses of people are mastering the BASIC language, giving them the illusion that they know how to write programs. In the present supply and demand relationships they may even find customers, and these "monolingual dilettantes" could flood the market.

The level of customer service activity leaves much to be desired. The time to send someone out is long, the repair work is of poor quality, the expertise of the service experts is not adequate and there are not enough spare parts. There are repairs instead of prevention. The idea that failures should be prevented has not developed.

In our questionnaires we also sought an answer as to the percentage reliability of the computers operated by the enterprises, or what percentage of the operating time was lost because of downtime. Some of the enterprises provided officially measured data, but most relied only on their own subjective estimate. Such estimates involve the emotional relationship of the respondent, his sympathy for the machine.

So the following analysis should not be regarded as a sort of precisely measured reliability statistic for computers used in Hungary. Rather, we are getting an answer as to the extent to which computer users are satisfied with the reliability of their machines, what their opinion about their own machines is.

The IBM computers have the best reputation. Their average reliability was put at 98.3 percent. They were followed by Siemens (96.6 percent), Hewlett-Packard (95 percent) and DEC (94.2 percent). The average reliability of capitalist computers was 91.8 percent according to 144 respondents.

The reliability data for machines imported from the socialist relationship and for those of domestic manufacture largely coincide. The difference between 83.3 percent and 83.7 percent is smaller than the imprecision of our survey. This finding does not justify the rather widespread view that Hungarian equipment is much better than that of our comrades in CEMA. Our respondents found the R-35 the most reliable socialist machine, and found the Robotron 6402 the worst. Of those of domestic manufacture the Videoton R10M (95 percent), the VT 30 (93.7 percent) and the KFKI TPA 1140 (93.3 percent) are most respected. According to our survey the least reliable Hungarian made computer is the KFKI TPAi (77.1 percent) or, among the microcomputers, the M08X. Unanimously and indisputably the worst and least reliable computer technology device is the Bulgarian made magnetic disk.

Trade, Marketing

The respondents formulated rather unanimous, a little superficial, but very condemnatory opinions to our questions connected with foreign trade.

According to many the foreign trade enterprises are hindering the adoption of computer culture and keeping up with the world market. According to the critics the foreign trade enterprises are not suitable, because of their structure and interest relationships, for carrying out foreign trade tasks connected with computer technology products. Many find the entire structure of Hungarian foreign trade faulty.

A number objected that the products are not being imported by those who use them, and many problems derive from this. A few noted that the foreign trade people dealing with computer technology do not have enough technical information or knowledge of the products, so their market activity is not only unsuccessful it is outright harmful.

But the opinion of the technicians is exaggerated and unjust, because it comes from a faulty view. Because of the almost complete lack of market relationships and a marketing attitude the developer feels that if he has created a brilliant device then the vendor has a really easy job. But the attitude on the capitalist markets is turned around. Marketing is not of a lower order. Indeed, the vendor tells the developer what he should develop, what will be needed on the market, what can be sold, and especially at what price the product must be put into series manufacture. In the world market view it is no "big thing" to discover something new, to put together a desk model of a super marvel. The really big thing is to discover what can be sold in large numbers after 2-3 years, to organize the cheapest series manufacture, organize the marketing channels, obtain the high quality related services, to organize efficient advertising and other marketing actions.

A computer technology product--whether hardware of software--is a confidence product. The western user who buys a Hungarian computer technology product is taking a risk. This risk is partly political and partly technical. The content of the political risk is that if the personal contacts slack off or even end because of visa difficulties or other reasons, then the user gets into a difficult situation. The technical risk comes from poorer quality and obsolescence. Only few users in the developed capitalist countries will assume these risks, and if he does then he wants to get the product at a substantially lower price.

A constant presence is needed for capitalist market sales. But this can be realized only at the price of great difficulties and high costs. The lack of mobility of our merchants, experts and leaders is a great disadvantage. Passport and visa difficulties and bad conditioning hinder and in many cases prevent urgent travel or unexpected route changes. The clumsy administrative mechanism also hinders capitalist market sales. It takes 4-5 months to "drive" a contract through the Hungarian bureaucracy. In this much time one should be able to build a factory.

It is a very great obstacle to capitalist relationship export that we do not have modern products, our equipment is unreliable and of poor quality, our prices are high, we have no customer service activity in the western sense, commercial capital is lacking, we cannot follow the great advertising needs, coming up in foreign exchange and absolutely necessary for capitalist market sales, and we can only undertake delivery time limits which are intolerably long.

Asking about domestic trade it turned out that there is no internal market. One cannot call the commodity distribution activity of a few factories and institutions in monopoly situations trade.

The greatest deficiency of the circumstances is that there is no complex problem solution. The manufacturers are concerned primarily with hardware. Recently they have set up for certain minimal software and service offerings, but they virtually never undertake consulting tasks. There is no organization to which a potential computer purchaser can turn to learn how he might solve his concrete problem, with what computer, in what configureation, with what programs and on what schedule. There is no one to tell him that computerization has organizational and other preconditions. The user is entirely on his own in these questions. Domestic trade is held back by the fact that it is virtually impossible to get reliable information. One can learn only through informal channels, through friendly conversations what which manufacturer is planning, what sort of new products are coming out, what the product will be able to do, when one can get it and for how much, how many units they intend to make, what the software offerings for the product will be, what sort of services are connected to the new product, etc.

Many regard the private and small cooperative "computer technology shops" proliferating with the spread of microcomputers as the first buds of a domestic computer technology trade and market. But for the time being these shops are only exploiting and skimming off the high, unrealistic price level, and not bringing it down.

Education

As a whole the majority of the experts consider the mass instruction in computer technology good. Here they are thinking primarily of the TV BASIC programs and the school computer program. A few celebrate the achievements quite highly indeed, calling them without example in the world. Many, however, caution against losing a sense of proportion and against glorifying easy, short-term successes.

It really is very nice and important that students prepare BASIC programs and establish contact with some sort of computer technology. But we must see clearly that these little school machines which do not know data protection, disk stores, line printers, networks, data file management or complex data management are not really computers. The BASIC language has a very important popular education function, but BASIC itself is not computer technology. The instruction--although very important--is little in itself and represents only the first, beginning step. It will be worth something if we can put cheap tools in the hands of the children.

Despite the successes of mass instruction there are problems with computer technology higher education. The enterprises complain that the preparation of the experts coming out of the universities and colleges is not adequate. The enterprises must make up for the deficiencies of education at their own expense for several years. There is no expressly computer hardware training in the technical universities, there are no university computer science institutes, faculties or sections. The programming mathematics of the Lorand Eotvos Science University is excessively theoretical and there are students who have never worked in a conversational microcomputer environment. Nor is there any training for software using economists. The universities cite their extraordinarily bad supply of tools. Because of this they are training masses of students for a third-rate, unreliable technology.

The use of computer technology here has spread primarily in management areas. True to our bureaucratic traditions we mechanized first in administrative areas, in finance, in accounting, in bookkeeping and in wage accounting. But the use of a computer is very rare in the main economic processes. The reason for this is that the use of computer technology has certain organizational preconditions which often do not exist at the enterprises. One cannot put the feudal system of informal contacts, the corruption, the material shortages, the delays and the chaos on a computer.

The other reason why computers are not used in the main processes is that the enterprises do not know how to begin with a computer, they do not understand them. High level intervention is too frequent in the acquisition of computers; the decisions are usually made at a higher level than where one could expect the optimal decision.

Often the enterprises do not trust a computer. This lack of trust is also manifested in the fact that frequently they maintain the manual processing even after the machine is installed. Thus computer technology is not accompanied by savings in personnel; indeed, new experts are taken on to use the new technology. In this practice computer technology is more of an extra cost than a profit. Unfortunately it must also be said that in many cases they are right because of the low reliability level.

So certainly we do have achievements in the mechanization of administration, but computer aid for creative intellectual work is rather backward. The mechanization of areas serving production directly is completely lacking, network applications are very rare, and the computerization of process control and industrial automation areas is limping along.

According to the experts one of the greatest obstacles to the spread of computer technology is the lack of an infrastructure, primarily of telephone lines. One cannot even speak of informatics in the present telephone situation, nor can one even formulate the need for computer technology progress.

What Should We Do?

The recommendations of the experts indicate that professional public opinion not only criticizes, it is also ready to help. Most see in a further economic opening the solution to the problems of high prices and poor variety. In the opinion of the experts a cheap imported supply of machines would create a healthy competition situation for domestic manufacturers and providers and would give a great boost to domestic applications. A characteristic proposal is that domestic manufacture should agree to copy a few imported models. The technology mastered in this way could provide a good foundation for competitive manufacture. A number expect great results from increasing computer technology investments, from suitable material and moral recognition for experts, from a radical reduction in material prices, from offering bank credits and preferences and from a significant reduction in taxes. Some are asking for a substantial reduction in the present magnitude of central withdrawals. It would mean an effective if not spectacular step forward in computer technology education, and advertising would not be the least thing, if the universities could get computers at a preferential price or even free of charge. Foreign capital should be brought into the Hungarian computer industry to an extent a good bit greater than at present with differential taxation and investment concessions and by aiding the foundation of joint enterprises.

In addition to these ideas we found among the recommendations a number of useful, interesting ideas worthy of consideration. The professional debate of the study promises to be exciting and in the course of it the representatives of the experts can see their ideas and proposals clash with one another and with those of the representatives of central economic guidance.

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DIGITAL SPEECH RECORDING, SYNTHESIS IN HUNGARY

Budapest MAGYAR ELEKTRONIKA in Hungarian No 1, 1986 p 86

[Article by T. K. in "Research-Development-Manufacture" column]

[Text] Two workers at the Computer Technology Coordination Institute, electrical engineers Tamas Acs and Tibor Bordas, have developed a digital speech synthesizer which does not have a mechanical sound but imitates human speech well.

Two versions of the Speech Modul have been prepared. Their common property is that they do not contain mechanical or electromechanical parts and that they store human speech, transformed into digital signals, in a compacted form, reducing redundancies.

The smaller version consists of a device which can be connected to a PROPER-16 computer and of a control program. The device has a microphone input and a headphone or external amplifier can be used for playback. Its dimensions are 5 cm x 15 cm x 20 cm. With this equipment the user can store sentences or words selected as he pleases (after saying them into the microphone) and then the message needed can be compiled and the new message can be produced. The device can be used in a more complex hardware environment also; in this case the program of the module must be adapted to the user program. Naturally it is enough to store one time the parts of a sentence which occur in multiple places. The system works with 8 kHz sampling, thus it gives outstanding sound quality between 100 Hz and 3.1 kHz. Four K bytes are required for one second of acoustical information.

The other version operates independently. It has its own microprocessor control and the power unit is built in. Its dimensions are 15 cm x 40 cm x 25 cm.

In its maximal version the system can watch 256 independent input signals. It can communicate various types of information in a human voice depending on the state and combination of these signals. The control program of the system and the various messages can be built up in different ways in accordance with the application. These can be stored in EPROM, which can be exchanged easily. The control program constantly watches the arriving signals (which can be TTL or other level signals, for example prell signals or those containing transients), solves the queuing problems, and then gives the appropriate message.

Considering all this the applications areas are very broad (for example, mass transit, traveler information, safety systems). For example, the signals could come from the sensors on an NC lathe and one could also use a standard RS 232 serial interface. The device will be used first at the Commercial Organization Institute where, in cooperation with the Federation of the Blind, it will facilitate the work of blind or impaired vision telephone operators.

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HUNGARY: CARRIER FREQUENCY DATA TRANSMISSION ON POWER LINES

Budapest MAGYAR ELEKTRONIKA in Hungarian No 1, 1986 p 86

[Article by T. K. in "Research-Development-Manufacture" column]

[Text] A wireless link is frequently not best when selecting a method for remote guidance, remote control or signal or data transmission and yet innumerable obstacles arise for building up a new cable network. At such times there might be secondary use of the existing electric grid for transmitting information, which saves time and money for the investor while the grid can be operated in its original function.

Engineers of the Oroszlany Coal Mines have been planning for 4 years and are offering such equipment on the basis of a patented solution, primarily but not exclusively for mining purposes. All types of operation require a line pair at any voltage level from 42 V to 35 kV. The grid section to be bridged can be at most 50 kilometers, the transmitter power of the devices is 50 mW to 20 W and the transmission speed is 60-1,200 bits per second.

Thus far they have prepared equipment for the following tasks: a 32 channel expandable device designated OGV-KE/HE and 32 duplex signal and data transmission units serving cyclic communication of 16 bit coded commands each. The OUT or IN switching command issued by the central transceiver can be executed with a local unit and it communicates this to the central unit. The pulse frequency collector, which also has 32 channels, provides transmission of the energy quanta of the pulse transmitter consumption meter, in simplex operation. The analog signal (pressure, heat, etc.) transmission device digitizes the signals of the remote transmitters and communicates the data to the receiver continuously in a cyclic time multiplex system. The receiver stores the data and then displays the same current on its analog outputs as was given at the inputs of the device.

The OR-VSZ/FSZ 1200 command and signal transmission equipment, working with a computer, is suitable for complex transmission in a carrier frequency system of information for industrial and agricultural operations covering large areas.

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FINNISH-HUNGARIAN ROBOT PLANNED

Budapest MAGYAR ELEKTRONIKA in Hungarian No 1, 1986 pp 86-87

[Article by T. K. in "Research-Development-Manufacture" column]

[Text] An arc welding robot has been operating at the Ikarusz Autobus Factory since 1983. The equipment of the ASEA firm has PTP control, a computer with 16 K bytes of memory built on cards and modules. The chief units are: a feed-in unit, an arithmetic unit, storage for various input and output data and the robot program, a control and finally a data communicator.

The simple robot and the workpiece turning equipment work for only one shift, because they have not found operating personnel for the other two shifts. So it is difficult to get data regarding whether the machine has paid for itself or how much profit it has made. One thing is sure, however, that the machine is irreplaceable in quality work, for overhead welding and for unhealthy work.

Now, at the Ikarusz factory, the Finnish Technological Development Center, the MTA SZTAKI [Computer Technology and Automation Research Institute of the Hungarian Academy of Sciences] and the BME [Budapest Technical University] are planning experimental development of an intelligent robot equipped with sensors which can be used in a flexible assembly cell. There have been a number of domestic achievements already, in developing sensors and in assembly applications of robots, which could not be used industrially because of the lag in robot development. So the goal of this development is to fit the Hungarian sensors to the robots of the Finnish NOKIA firm. They want to make this robot suitable for any typical assembly operation, for example driving sheet screws in holes located in a way not precisely known in advance.

In addition to the technical-economic goal the feasibility study is intended as an example of cooperation among institutions of the two countries. Preparation of the contracts is under way.

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OUTLINE OF WORK OF HUNGARY'S TELECOMMUNICATIONS RESEARCH INSTITUTE

Budapest MAGYAR ELEKTRONIKA in Hungarian No 1, 1986 p 87

[Article by Gyorgy Battistig, scientific chief engineer, in the "Conference Further Training" column]

[Text] The Telecommunications Research Institute (TKI) recently commemorated the 35th anniversary of its founding with a jubilee scientific conference.

The TKI is an industrial research institute. In the course of three and a half decades of its operation it has developed in the process of the cultivation and evolution of the Hungarian electronics industry and telecommunications therein together with the domestic producing enterprises, institutes and institutions interested in these areas. In this development the workers of the institute have prepared for and laid the foundations of the solution of numerous domestic telecommunications tasks with their experimental activity and activity based on creative application of systems and network theory, electromagnetic field theory and other interdisciplinary sciences. With concrete product development and documentation work they are participating in creating and expanding the manufacturing branch's always modern product base fitting user needs and they are proving the results of research and development with model systems and equipment. Within the framework of this manifold activity the institute regards as its task the development of all those technologies, subassemblies, measuring instruments and special elements and the development of procedures to increase efficiency which raise the modern technical and economic level of product development and production.

The needs which appear in telecommunications and informatics systems and equipment and in the special subassemblies and constituent elements of these constituting the product base for a modern branch of industry, competitive at home and abroad, contributing to the development of the domestic infrastructure and at the same time basically export oriented have always determined the current content of the activity of the institute.

At the scientific conference held on the occasion of the 35th anniverary the approximately 60 special presentations and 50 posters of the workers of the institute provided the possibility of a broad review of the activity here which takes many directions, is at a high scientific level and contributes at essential points to the development of telecommunications and the use of electronics, the possibility of a broad review of the results achieved and of the plans for the near future. The scientific reports vividly reflected the close link between the various scientific areas and the solution of industrial problems in the work of the institute which has been realized primarily by virtue of the creative thinking of the experts.

8984
CSO: 2502/28

AUTOMATED MEASURING FOR TESTING DIGITAL CIRCUIT BOARDS

Budapest MERES ES AUTOMATIKA in Hungarian No 11, 1985 pp 406-410

[Article by Gabor Csurgai, Geza Haidegger and Andras Krizsan, Computer Technology and Automation Research Institute of the Hungarian Academy of Sciences: "An Automated Measuring System Based on a Microcomputer For Testing Digital Circuit Cards". The first paragraph is the Hungarian language summary.]

[Excerpts] The article discusses functional testing of digital circuits. The authors describe widely used automated measurement methods and then analyze the hardware and software questions of the microcomputer measuring system proposed by them. The developed measurement system can be used in a broad area as an independent manufacturing tool and as an option which can be built into equipment.

The Developed Measuring System

A multiprocessor, distributed intelligence industrial control system (distributed PLC) has been developed at the Communications Engineering Factory under the model name EAK-03. We developed a card testing unit for functional testing and diagnostics of the card elements of this system.

The card testing station makes possible the testing of digital circuits and is not limited only to testing the cards of the EAK-03 control system.

The cards to be measured are connected to the measuring system via a 64 pole card terminal, but 50 optional measurement points are available to which one can attach additional terminals or IC clips.

The card measuring station operates as an independent, intelligent measurement device into which one can load programs created on the program development system by means of data transmission couplings. Developed card measuring programs burned into EPROM's can be run directly on the card measuring station.

The automated measuring device consists of microcomputer modules manufactured in series and a special interface card (PANel TEsteR). The elements of the general module set are:

--the processor module: CPU, TIMER, EPROM, RAM,

--the memory module: RAM and an EPROM expansion possibility,

--the serial coupling module: for connecting a general alphanumeric display and a program development station,

--the video module: a screen control circuit, and

--the PANTER interface for the card to be measured: An optional digital TTL or three-state signal can be sent to any terminal of the card to be measured; all the signals can be read back and processed. The interface is also suitable for measuring a high frequency (10 MHz) impulse series. There is a counter display, sound display and analog current indicator. The interface card can also be connected simply to the bus of any other microcomputer.

```
Program development|  (communication)  |Card measuring|     |Alphanumeric
station            |-------------------|station       |-----|display
TELA, KERET        |                   |KABI          |     |
                                         |
                                         |
                                        Interface
                                        electronics
                                        -----------
                                        Card to be
                                        measured
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TELA--test language translator
KABI--automatated measurement device interpreter
KERET--development system

Experiences, Possibilities for Further Development

The efficient utility of the measuring system has been proven. The time for testing complex digital circuits has been reduced to servaral times 10 seconds. Zeroing in on the failures is very fast and simple using the GUIDED PROBE method. The possibilities of the test program language subroutine and macro-management can also be exploited well in testing circuits containing more complex LSI parts.

On-the-spot interactive editing of test programs has arisen as one possibility for further development. Another possibility would make the advantages of a hardware reference exploitable by connecting two PANTER measurement interfaces in parallel.

Manuscript received 3 July 1985.

Biographic Notes

Gabor Csurgai completed his studies in the Instrument and Control Technology Section of the Electrical Engineering School of the Budapest Technical University in 1979. After earning his degree he was assigned to the Machine Industry Automation Main Department of the MTA SZTAKI [Computer Technology and Automation Research Institute of the Hungarian Academy of Sciences]. He participated in installing and starting production on the IGYR-630 integrated manufacturing system at the CSMSZG and in starting manufacture of and servicing the DIALOG CNC. His chief work area is designing control technology systems for machine industry integrated manufacturing systems and cells and developmental tasks connected with this.

Geza Haidegger graduated from the Instrument and Metrology Faculty of the Budapest Technical University in 1978 and participated in special engineering training there. He works as a scientific colleague at the MTA SZTAKI in the Machine Industry Automation Main Department. He deals with hardware and software questions of microprocessor control systems, with diagnostics, with distributed multiprocessors and with the system technology of integrated material processing and data processing systems.

Andras Krizsan finished his studies in the numerical control machines and equipment section of the Mechanical Engineering School of the Budapest Technical University. After completing his studies he was assigned to the Machine Industry Automation Main Department of the MTA SZTAKI. He participated in designing and implementing the process control software for the IGYR-630 integrated manufacturing system and in putting the system into operation. His research areas are designing control technology systems for machine industry integrated manufacturing systems and manufacturing cells and designing and implementing software for control technology systems.

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RESEARCH, DEVELOPMENT AT HUNGARIAN ACADEMY OF SCIENCES

Budapest MERES ES AUTOMATIKA in Hungarian No 11, 1985 pp 428-430

[Article by Dr Gyula Stokum, Instrumentation and Measuring Technology Service of the Hungarian Academy of Sciences: "Concerning Research and Development Activity of the Instrumentation and Measuring Technology Service of the Hungarian Academy of Sciences"]

[Text] "Return to a Higher Level?"

The Instrumentation and Measuring Technology Service (hereinafter, Service) of the MTA [Hungarian Academy of Sciences] received the possibility of independent operation in 1957 under the name Instrumentation Service of the MTA, in the form of a research institute.

During the initial search for paths of the first 10 years the leadership of the Service recognized that under the domestic conditions then and with the structure of the Service then it could develop further only if the conception changed. The essence of the new conception was that the Service should not have the character of a research institute but rather that of a service institution, one which was capable of sustaining itself entirely from its own receipts. So the two basic tasks of that time, professional consultation and loaning instruments, supplemented by additional activities fitting into the profile--in harmony with the needs of the research and development institutions--should be performed as a service.

The period which has elapsed since 1967 proves the correctness of the change in conception.

The Service has developed vigorously. Within its sphere of activity the service activity has developed most dynamically, together with loaning instruments. The number of its organizations offering national level services has increased significantly also. Thus the Secretariat of the Instrument Affairs Committee of the Academy (MTA MB), the Secretariat of the National Large Research Instruments Committee (OKNB), the National Instruments

Registry, the National Instrument Service Registry and the Free Instrument Capacity Database have found a place within the frameworks of the Service. Along side these service type activities the development of the measurement technology, acoustical and instrument development areas, presuming a greater research potential, has been much less spectacular.

So today the Service has become an institution offering primarily national services judged to be important.

But the question arises whether the service experience accumulated over 27 years, the system of vital contacts developed by loaning instruments and servicing the products of manufacturers operating in the area of the instrument industry, leaders even on a world scale, the knowledge of the highly qualified expert staff, the mass of information which can be accessed directly and the instrument property accumulated since the end of the 1970's in an admittedly difficult economic situation short of foreign exchange do not justify a more vigorous development of research and development activity within the Service. Would it be possible and worthwhile to return in part to the original research institute conception at the higher level guaranteed by the broader material-technical base which has developed in the meantime?

In order to support an affirmative answer we want to describe below the present research and development activity of the Service and the conditions under which it operates.

Measurement Technology Services

Since 1962 the Service has been taking care of measurement commissions coming from various areas of the people's economy.

The Service either solves the measurement tasks independently in their entirety by relying on its own instrument park or it participates in the solution of partial tasks to the degree desired by the party commissioning it. Instrumentation at a level exceeding the national average and well trained experts are available for this.

The measurement technology service is complex and has a modular character. It is complex because one can ask for professional opinions and supplementary instrument development together with the formulation of the measurement task, development of the measurement method, execution of the measurement and manual and computer processing of the measurement results. And it is modular because any one of the above listed services can be requested separately, thus without any tie-in.

The Service has traditions in the following professional areas:

--measuring stretching, force, pressure, torque and movement and other quantities which can be attributed to these;

--measuring temperature increase and dispersion;

--infratechnique measurements (AGA Thermovision);

--acoustical noise and vibration measurements in the frequency range 2 Hz to 200 kHz;

--vibration measurements all the way down to a low frequency limit of 0.03 Hz;

--measuring electrical quantities; and

--as the newest service use of optical methods for movement, vibration and distance measurement.

Several characteristic tasks solved in recent years are:

--measuring the noise of the arc furnace of a steel foundry from the viewpoint of product quality and place of work noise load;

--performance and current measurements for the lifting motor of a portal crane using measuring instruments based on the Hall effect;

--analysis of environmental vibrations influencing the precision of a gravimeter (an instrument measuring the gravitational constant);

--measurement and analysis of the vibration load caused by handheld pneumatic tools with sensors placed on the hand-arm system of the workers;

--vibration measurement and analysis for dynamic state studies of bridges;

--measuring the bending resistance of shoe industry leather materials on a Bally type bending machine supplied with special stress sensors;

--noise measurement of plants at work sites of workers, making judgments in accordance with standard MSZ 18 152;

--measuring the propagation and statistical characteristics of transportation noise;

--measurement of the damping factor of impact sound damping covering materials with the resonance method;

--measurement of temperature dispersion with small heat inertia heat elements;

--determining the location of failures in heating lines with an acoustical measurement method and a correlation signal processing technique;

--technological studies of rubber industry machines; and

--stress measurements on turning axles supplemented with nontouching signal transmission and heat measurements for a study of the energy balance of the technology.

Computer Processing of Measurement Data

Laying the foundations for measurement data processing and computer technology activity goes back to 1975. At this time there was a hardware and software investment which made possible for the first time in our country a program controlled measurement data collection and computerized data processing service making use of a GPIB bus system (IEEE 488 and ANSI MC I.I. standards).

The present measurement data collection and processing system consists of two configurations:

1. Computer technology units with measurement network control (controller function also) and

2. A network which can be controlled by a small computer (controller) and measurement systems containing special processors carrying out real-time processing of measurement data.

The two configurations can be used separately or together. The structure of the several configurations depends on the nature of the task to be performed.

Programs purchased ready-made or developed by ourselves make it possible to use the hardware in many ways.

The architecture described makes it possible for the computer processing of measurement data to have a complex and modular character just as the service does. It is also complex and modular in the sense that it adapts to the measurement technology services and supplements them.

It provides computer technology support for the systematizing, processing and evaluation of measurement data. With the tools of modern computer technology it supports the professional opinions prepared within the frameworks of the measurement technology service. As a service with a modular architecture it also makes it possible for the individual modules to be ordered as separate services or as supplements to modules of the measurement technology service.

Computer processing of measurement data has traditions at the Service in the following areas, as examples:

--establishing the change in material status of structures (for example of bridges worth billions);

--evaluation with statistaical methods of large numbers of samples;

--preparing numerical record tables, technical drawings and functions on a digital plotter and line printers;

--digitizing measurement results from multichannel analog data records and data processing;

--real-time frequency analysis;

--determining changes in state of structures as a result of dynamic loads;

--a table procedure for the spectrum of vibration acceleration in optional job-file groups;

--an octave band N--loudness--evaluation procedure;

--a procedure to calculate and record an autocorrelation function;

--a normalized Gauss function generator;

--judging the effect of vibration on humans on the basis of MSZ 18 163/2-83;

--depicting pressure swings for fluids in pipes as a function of time;

--dynamic studies of bridges, seeking the value for autovibration; and

--evaluating network disturbances with a mathematical statistical method.

Instrument Development Services

Earlier instrument development was a part of the measurement technology services, especailly of tasks requiring new measurement procedures.

As of today this service has been supplemented by the development of custom instruments the manufacture of which the profile patron has not undertaken because of their character and the small number of units.

The instrument development service has traditions in the following special areas, as examples:

--semi-automatic devices to measure the parameters of magnetic materials;

--measurement amplifiers for heat and pressure sensors;

--an automatic device to check protection against contact;

--an instrument suitable for measuring the detonation speed of explosives;

--special interface units for personal computers;

--a multichannel, microprocessor controlled measurement data collector;

--systems for optical certification of aircraft landing equipment (ILS);

--a measurement data collector which can be controlled by a microprocessor or a personal computer for supervision of oil well drilling equipment; and

--a measurement data collector which can be controlled by a microprocessor or a personal computer for status checking of the line terminals of electric power distributers.

Computer Technology Services

The Service hopes to introduce this service beginning in 1985.

The Computer Center of the Service sees a possibility for performing jobs of the following types:

--preparing and operating database management programs;

--preparing and running programs for technical and scientific computations;

--computerized evaluation and depiction of measurements and data prepared for special purposes;

--preparing programs for management systems and operating the systems;

--running programs written by outside users;

--providing machine time (together with an expert) for program development;

--direct computer evaluation of measurement processes; and

--program development on personal computers.

The computer technology devices which can be used for the above are:

--an HP-1000 computer (50 M byte disk, graphic terminal, graphic printer, magnetic tape unit and plotter);

--a VT-30 computer (three terminals, two printers and 20 M byte disk);

--two VT 20 A small business computers (one machine connected to the ASZSZ [State Administration Computer Service] network;

--Commodore 720 semiprofessional computers with 2 M byte floppy units; and

--C 64 personal computers.

Some of the computer technology devices listed will form a computer network beginning in 1985, increasing the use possibilities of the devices.

Services of Acoustics Research Laboratory

The Acoustics Research Laboratory (hereinafter, AKL) was formed in 1950 within the framework of the Physics Institute of the Lorand Eotvos Science University. Since then it has gone through several reorganizations and has developed dynamically. It is characterized by a collection of special acoustical measurement facilities typical of "large laboratories" (a dead room, a sounding room, listening area, ultrasonic tub and a low frequency Kundt tube), by precision acoustic measurement possibilities and by small computer measurement data processing. At present there is no other similar acoustics laboratory in the country cultivating the area so comprehensively.

The activity of the AKL is extraordinarily varied. It is adapted to the measurement technology services, it makes use of the instrument development services and beginning in 1985 it will also rely on the services of the computer center.

A few characteristic tasks of recent years are:

--infrasonic studies;

--large laboratory services in the voice frequency range in the dead room and sounding room. Electroacoustic measurements and development. Measuring the characteristics of the sound space (sound pressure, phase);

--measuring the performance of noise and sound sources;

--measuring the sound absorption factor in the sounding room and in the Kundt tube;

--subjective studies. Psychoacoustic studies in the dead room. Subjective judgment of loudspeakers in a standard listening area. Subjective evaluation of recordings made of noise sources and noisy environments;

--an acoustical study (diagnostic) of sound source recognition, materials and structures;

--development and small series experimental manufacture of vibration sensors;

--vibration analysis and acoustical emission research. Checking the vibration of machines and structures, recognizing and locating faults (vibration diagnostics);

--room acoustic studies. Determining the newest room acoustic factors (transparency, sound purity, time delay bolt, various characteristics of sound energy dropping). Acoustical and subjective evaluation of rooms;

--studies of the environment of noise sources, noise protection studies and preparing plans, environmental protection consultation. Noise protection prime contracting activity from survey to implementation;

--ultrasonic studies, ultrasonic intensity measurement. Measurement in an ultrasonic free sound space (ultrasonic tub);

--acoustical material studies and acoustic spectroscopy;

--various acoustical developments, preparing special devices, automating manufacturing processes on the basis of a measurement of the acoustical characteristics;

--free sound space certification of microphones, certification of vibration sensors;

--applied acoustics research on the basis of commissions; and

--speech recognition studies, recognition and analysis of acoustic signals.

Summing Up

In the foregoing we have described the present research and development activity of the Service. It can be seen that it extends to:

--measurement techniques for various physical tasks;

--computer processing of measurement data;

--solving the special device development tasks which come up in the course of the measurement and other service activity (e.g., instrument loaning or service);

--computer technology services; and

--research and development embracing very many areas of acoustics.

It can also be seen that these activities are special research and development areas adapted to one another and aiding one another for which a very favorable system of conditions is provided by, among other things, the national level service activities of the Service, loaning instruments and instrument servicing.

The Service intends to increase these favorable factors for a more vigorous development of research and development activity by using such modern material and moral incentive methods as:

--support for VGM [enterprise workers' business partnership] activity;

--purchase of licenses;

--support for the innovators' and inventors' movement; and

--ensuring author's legal protection for software.

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EAST EUROPE/SCIENTIFIC AND INDUSTRIAL POLICY

PRESIDENT TRACES DEVELOPMENT OF BULGARIAN ACADEMY OF SCIENCES

Sofia BULGARIA TODAY in English No 458, 1986 pp 4-5

[Article by Angel Balevski: "The Socialist Revolution and the Development of Science"]

[Text]

The socialist revolution of September 9, 1944 found Bulgaria with a highly underdeveloped industry. That is why at the very beginning of the socialist revolution the party set science the important and responsible task of providing scientific back-up for industry and the other spheres of the economy, and of linking up research with practical necessity. The efforts of Bulgarian scientists and their interests were directed towards a wide range of practical activities. Practice thus began placing orders to benefit society with science, which in its turn received new ideas and tasks for its development.

The maintenance of a constant effective relationship between science and production has been, and continues to be, the core of the Bulgarian Academy of Sciences' policy over the past 20 years.

An important step in that direction was taken in 1963 when 25 scientific coordinating councils in the major fields of science were set up with the Bulgarian Academy of Sciences. There were scientists and specialists from the Bulgarian Academy of Sciences, from higher education establishments and from the study organizations of ministries and departments on these councils. At the same time the Bulgarian Academy of Sciences developed the first Bulgarian computer. In 1963, 28 development projects were presented to the State Committee for Science and Technical Progress and to economic ministeries for trials, along with 14 development projects for applied production. The number of such projects has risen to an average of 130 per year. The Academy has gradually stepped up its research in the most modern and strategic scientific fields. During the sixth five-year plan period it intensively channelled its research to serving practical needs. As a result, 417 scientific developments were adopted (during the fifth five-year plan almost half as many had been adopted). This resulted in new technologies, materials, machines and unique apparatus for production and scientific purposes.

The development of computer technology and software was given substantial support by the Academy. In 1977 more organized, planned and purposeful scientific back-up activity in a number of economic sectors through cooperation contracts with economic ministeries was begun. The Academy now collaborates on joint programmes with nine economic sectors.

In 1977 a new form of direct linkage between the Academy's activities and practice was established through the conclusion of contracts on cooperation and scientific assistance with individual districts and areas in the country. The first such agreement was signed with the Blagoevgrad district. This form of cooperation has been significantly developed since then and now accounts for a large proportion of the Academy's activities.

The BAS is now working on eight territorial programmes incorporating 684 projects for the districts of Blagoevgrad, Plovdiv, Varna, Razgrad, Bourgas, Pleven and Sofia city as well as other districts. Also included here are the Rhodope and the Strandja-Sakar programmes.

During the eighth five-year plan a new field emerged at the Bulgarian Academy of Sciences – instrument design and the automation of research.

Despite the great difficulties encountered in the past, this activity began to yield considerable results for science and the national economy, and for its export to the socialist countries...

The nuclear reactor at the Nuclear Energy Research Institute, the National Observatory near Smolyan, which has a powerful two-metre telescope, the Computer Centre at the Unified Centre of Mathematics and Mechanics, research and development centres, pilot plants and scientific and production enterprises are all fruits of the socialist revolution and the development of science.

The establishment of these facilities help to achieve complete scientific research, which is then introduced into production. The state is investing increasing funds in research and development.

Bulgarian science has developed, strengthened and firmly established itself as a socialist science in the service of socialism and the interests of the socialist community, advancing side by side and closely integrated with Soviet science, drawing on its experience and on the experience of the most powerful and prestigious academy in the world, the Soviet Academy of Sciences. We the present-day builders of socialist Bulgaria and Bulgarian science are proud of our scientific ties and cooperation with the Soviet Academy of Sciences as they are a strong link in the chain of Bulgarian-Soviet friendship, a dear historic gain and a sound basis for our country's future. We are proud of our traditional friendly relations with Russian science and Russian scientists who even during last century showed a great interest in the problems of Bulgarian science, language and culture.

They sympathized with the Bulgarian people and helped them in their cultural development. I would sum this cooperation and sincere and unique friendship up as follows: 'One thousand years of history plus socialism.' The Bulgarian Academy of Sciences came into being and developed as a socialist type of academy thanks to the assistance of the Soviet Academy of Sciences. The conclusion in 1950 of an agreement between Bulgaria and the USSR on the establishment of a Commission for Scientific and Technical Cooperation marked the beginning of even closer alignment in the field of science and technical progress.

It was thanks to Soviet assistance that the main branches of the national economy were built up and Bulgarian's entire scientific and technical potential created. During the years of our cooperation with the Soviet Academy of Sciences which began in 1958 with the signing of the first agreement between them, more than half of our academy's potential has gone through the great school of Soviet science. Soviet scientists have also supported us in developing the latest scientific trends in this country.

The Academy is an active participant in the Intercosmos Programme and in the international centres for joint scientific research and for updating the skills of scientific personnel. These include the international laboratory for strong magnetic fields and low temperatures in Wroclaw, Poland, the Banach International Maths Centre inn Warsaw, the international centre for heat and mass exchange in Minsk and the international electronic microscopy centre in Halle, GDR. By participating in the socialist community countries wide--ranging activities the Bulgarian Academy of Sciences fulfils an important international function in making its contribution to the strengthening of its potential. It is participating in the work on 17 problems included in CMEA plans and is the principal performer of four of them. 28 of its scientific units are involved in researching these problems.

During the years of socialist constructtion the Bulgarian Academy of Sciences has gained a good reputation in this country and abroad. Through its international relations it has won confidence and become a representative of Bulgarian science and culture abroad and, above all, it is a welcome partner for cooperation with the academies in the socialist countries and many academies and research institutes in western countries. Its international links enable it to use foreign scientific experience and achievements, to ensure the presence of Bulgarian science in world scientific exchange, and thus to participate in the important process of establishing closer contacts and cooperation among nations in the name of peace, understanding, humanism and progress.

PHOTO CAPTIONS

1. p 4. The first Bulgarian discovery was made by the renowned Academician Georgi Nadjakov. His discovery, which was registered in 1974, was the photoelectronic state of substances.

2. p 4. The second Bulgarian discovery, registered in the Bulgarian Discovery Register in 1979, was a sixth heart-tone, discovered by Dr Ivan Mitev, a long-serving pediatrician from Sofia.

3. p 4. The title of the third Bulgarian discovery is 'Metallotropic tautometry in metallic derivatives of keto-enoles.' The formula for this discovery was devised by Prof Hristo Ivanov and Prof Peter Markov of Sofia University's Chemistry Department, and was announced in the publication of the Institute for Inventions and Rationalizations in 1983.

4. p 4. The fourth discovery, also announced in 1983, was 'The laws of crystallomorphological evolution of minerals during mineral formation processes.' Its authors were Academician Ivan Kostov, associate prof. Mihail Maleev, the geochemist Bogdana Zidarova and six Soviet geochemists.

5. p 4. The fifth discovery, registered in 1983 at the USSR State inventions and Discoveries Committee, was 'Laws governing alterations in the radius of strong proton interaction at high energies.' It was the second joint Bulgarian-Soviet discovery, whose Bulgarian co-authors were corresponding member of the Academy of Sciences Pavel Markov and associate professor Velko Zayachki.

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CSO: 2200/19

CZECHOSLOVAK STANDARDIZATION OFFICE SETS 1986 GOALS

Prague CESKOSLOVENSKA STANDARDIZACE in Czech No 1, Jan 86 pp 1-3

[Article by Timotej Hill, C.Sc., Chairman of the Office for Standardization and Measurement: "Tasks of the Office for Standardization and Measurement in 1986"]

[Text] The year 1986 is the first year of the Eighth 5-Year Plan, a new 5-year period which should bring our working people further all-around satisfaction of their material and emotional needs, and further growth of its standard of living and social security.

The qualitative changes in the structure of the material and cultural needs of the people place higher and higher demands on the quality of the available range of industrial goods and food products, on the level of business and services, and on transportation and other areas which are prerequisites for the satisfaction of human wants.

It is necessary to make significant progress in carrying out the long-term strategy of economic and social policy already under the Eighth 5-Year Plan. Its contents will have to be based on all the positive attainments of the fulfillment of the Seventh 5-Year Plan. We must realize that in order to fulfill all the tasks in the future socio-economic area, the annual growth of national income should be a minimum of 3.5 percent. This is a demanding task, but analysis shows that it is realistic and unavoidable. Gradually, we want the effectiveness of our economy to reach a level comparable to that of the industrially developed countries of the world, and to increase our contribution to the economic competition of socialism with capitalism.

To achieve a general change toward intensification and a more rapid strengthening of the qualitative sides of production, to increase the technical level of the national economy and the high effectiveness of the evaluation process--all these are unavoidable demands of today, unavoidable ways to ensure a significant growth of the effectiveness of the economy and the social productivity of labor. This, of course, increases the demands on effective development, on the realization of structural changes and on the modernization of, in particular, industry, electrotechnology and other individual fields of the processing industry, and on the intensification and stability of agricultural and food production. The fulfillment of all these aims is dependent mainly on a more decisive and widespread application of scientific and technological progress. This means also to place higher demands on the scientific research and development base and on application of the results of this base in practice, to make more extensive use of the newest knowledge from world science and technology, to better introduce modern progressive technologies and more decisively ensure mass consumer product innovation.

In this regard, it bears noting that there are extensive programs being accepted for the period ahead. These concern mainly the nuclear program, the program of electronization of the national economy, automation, robotization, and the introduction of flexible production systems programmed for the consumption of fuel, energy, metals and other materials, the utilization of secondary raw materials, and the program for the development of areas ensuring the production of food crops and the development of biotechnology, as well as the program for preserving and protecting the environment.

Carrying out these programs presupposes a broad, creative initiative on the part of all working people. The activities controlled by the UNM (Office for Standardization and Measurement), which are a part of the State Technical Policy, are directly associated with the application of the results of science and technology in practice. Therefore, even the employees of our office now have and will continue to have significant tasks in the current 5-Year Plan.

The turning point of this period of our development will doubtless be the most significant domestic policy event: the 17th Congress of the Communist Party of Czechoslovakia, which will begin on 24 March 1986 and which will approve the "main directions of economic and social policy of the party for 1986-1990 and looking toward 2000." This document will be a fundamental and initial touchstone orienting the activity of our Office as well. Therefore, it will be necessary immediately after the 17th Party Congress to work out the "main directions of economic and social policy of the party for 1986-1990 and looking toward 2000" at all levels of management in the center itself and in all organizations under the office. It may naturally be assumed that it will influence the plans for the main tasks for 1986 which were approved late last year or early this year. It will therefore be necessary immediately to coordinate these plans with the new tasks set in the economic and political part of the 17th Congress of the Communist Party of Czechoslovakia.

During this period, the question of planning acquires particular significance because it is the basic management instrument for ensuring the strategy of our economic policy. It is of course necessary in this connection to further improve planning for the proper functioning of economic mechanisms at all levels. At its full significance, this also pertains to the creation, general contents and veto power of the State Plan of Standardization, including its control and the evaluation of the fulfillment of individual tasks in regards to the satisfaction of social needs.

At the present time, the UNM, in cooperation with the SK VTRI, is preparing a number of documents of basic significance which, if accepted, can significantly influence the activity of the office in 1986 and in the years ahead. This is one of the key tasks which the UNM is fulfilling this year.

The documents are as follows:

-- "Proposed principles of an improved system of quality control in the Czechoslovak national economy and necessary measures for its implementation."

-- "Proposed basic measures in the area of testing, metrology and technical standardization leading to the improvement of quality of Czechoslovak production."

-- An amendment to Law No. 30/1968 Sb on state testing.

-- Preparation of proposed principles of the law on state control of standardization, metrology and testing.

The following brief remarks complement the above.

Problems with the quality of Czechoslovak products have in past years been the focus of the attention of party as well as state authorities. They were the subject of the conclusions of the 15th and 16th Congresses of the CPCZ and some associated plenary sessions of the CPCZ Central Committee, as well as documents of the CSSR Government. A fundamental turnaround was expected, particularly from implementation in previous years of Decision No 178/1977 of the Presidium of the Government of the CSSR, on the basis of which complex systems for product quality control in the economic sphere were built. However, it must be stated that the present measures have not brought about a sufficient basic turnaround in the growth in the improvement of the quality of Czechoslovak products. This is objectively apparent from the relatively low competitiveness of Czechoslovak products in the markets of the foreign developed countries as well as in the low turnover of the supplies of some technically obsolescent products on the domestic market.

A detailed analysis of these problems highlighted an extensive range of deficiencies at various levels and to various extents. Therefore, particularly in connection with the Government Decision No 296/1983 on speeding the application of results from science and technology into practice. It was once again decided to work up a proposal for improving the system of quality control as an integral part of the system of control of the Czechoslovak national economy; by the application of an optimum combination of instruments and direct and indirect controls, the quality control system would lead to a continuous desired improvement of product quality and to the planned creation of all the prerequisites for it. It is accordingly desirable to tie into the measures for analyzing and working out an improved system of controls of the national economy for the Eighth 5-Year Plan. Of course, an important role in this system must be played by the activities of our office, the effectiveness of which has multiple effects at all levels. The technical standard, and the corresponding level, measuring and testing of materials and products, are all basic prerequisites for control of the quality and reliability of Czechoslovak products.

The UNM must ensure a rapid, continuous process of the creation of technical standards providing indicators of product quality in harmony with similar international standards, which will ensure a mutual conformity of Czechoslovak standards with international standards and will create prerequisites for the international division of labor and trade.

The metrological ensuring of production and the preparation of production in this system are considered to be irreplaceable parts of the production process and conditions for reaching the desired quality, particularly in automated mass production.

In the case of state testing, the increase of its significance and how it affects the quality of Czechoslovak products is assumed by making the process of determinig technical demands for evaluation more objective, by the importance of state testing during the product research and development stage (particularly during the determination of technical demands for a particular area of products important to the national economy), during the increase of the effectiveness and extent of control in the production sphere, and last but not least, during the certification of products, which, as regards Czechoslovak foreign trade, bears an extraordinary significance.

In the case of the second document, it should tie in with the concrete measures worked up in detail in the earlier document for solving the system of quality control. The urgency of both documents is a result of all presently conducted analyses of how best, most rationally and most effectively to ensure society's needs to ensure and improve the quality of Czechoslovak products through the technical activities of our office. In this regard, tasks had already devolved upon the office particularly by virtue of Decision No 296/1983 of the Government of the CSSR on the prompt placement into practice of the results of science and technology, by Decision No 243/1984 of the Government of the CSSR on further development of the system of planned control of the national economy, and last but not least, in the testing area, by Decision No 208/1984 of the Presidium of the CSSR Government. A number of tasks from this area have already been fulfilled in the course of the last year. However, a majority of the more important tasks remain to be carried out.

For many years, the UNM has been extensively active in the legislative area. This is natural because economic developments, especially in the last few years, both in the world as well as in Czechoslovakia, demand some new approaches to the control of all three of the Office's technical activities. For this reason, an amendment of the Law on State Testing is being drawn up quickly. This was prompted in particular by the previously mentioned Decision No 208/1984 of the Presidium of the Government of Czechoslovakia and by the Law on the State Control of Standardization, Metrology and Testing. It is presumed that this integrated law will create the legal framework for individual management of all three activities as state activities that form part of a system of quality control; at the same time, a prerequisite for the flexible adjustment of legal regulations in this area will be created if the changes in the economic mechanism of the Czechoslovak national economy so require. The amendment of Law No 30/1968 Sb should above all make it possible to increase the demands on the present effectiveness of state testing, particularly the introduction of certification as an important instrument in regard to the needs of foreign trade. Of course, in this regard, it will be necessary to quickly work up and publish corresponding proclamations and methodological procedures.

From the approved plan of the main tasks of the UNM for 1986, I consider it necessary to emphasize that, in addition to the general tasks and duties within the framework of the effectiveness of each of the departments of the office, there must be special emphasis on the following tasks in particular.

(a) From the area of technical standardization:

-- A proposal for improving the system of standardizing work centers, with the subject area divisions responsible for the entire area of technical standardization;

-- The area and the tasks of technical standardization in the system for automating projection and construction work and a proposal in the area of measures for the creation of standards in this regard.

(b) From the area of metrology:

-- A proposal of methodological indicators of metrology for establishing centers for metrological services;

-- A proposal of methodological indicators of metrology for releasing a sample metrological order of organizations;

-- News about metrological securing of important areas of the Czechoslovak national economy concerning the application and finishing of schemes for interrelating standards of main physical and technical components;

-- Research on the needs of primary benchmarks and the ensuring of ranking of standards through 1995.

(c) From the area of state testing:

-- Technical and economic indicators in the course of the mandatory evaluation of products;

-- Re-evaluation of the structure of products selected for mandatory evaluation in regard to the present and prospective needs of the national economy;

-- Tasks in the organization area pertaining to the delimitation, transfer and creation of new state testing centers.

(d) From the area of information control and information systems:

-- The development of realistic information services in the area of standardization, in particular with regard to subsystem A 13;

-- A concept of national automated information service in the area of Czechoslovak, international and foreign standards;

(e) From the area of the subsidiary scientific and development base, proper material and cadre security and the fulfillment of all tasks of the plan for 1986 which are closely connected to the direct needs of the national economy at a highly specialized level.

(f) From the international area:

-- Proposal of the decision of the CSSR Government pertaining to the agreement between the USSR and the CSSR in the field of technical standardization, metrology and care of quality of products;

-- Work on the preparation of the agreement on creating and realizing the system for the evaluation of quality and certification of products mutually traded among the CEMA member countries on the basis of CEMA standards;

-- Evaluation of the cooperation of the CSSR with other CEMA member countries in the area of standardization, and proposals for deepening and improving cooperation in this area;

-- The deepening of active participation of the CSSR in the work of international standardization organizations (ISO, IEC);

-- The development of effective mutual cooperation with the socialist and nonsocialist countries with which the CSSR is developing economic cooperation. To the extent possible, to provide assistance to developing countries using UN/UNIDO.

(g) From the investment area

-- The emphasis on ensuring the Second Construction (Laboratory H) at the CSMU Bratislava.

The organizational structure of our office, with its compartmental arrangement, is being adjusted to the new tasks awaiting it under the Eighth 5-Year Plan. The basis is being established for prospective further organizational solutions which would best ensure the fulfilling of tasks given to the office in the Eighth 5-Year Plan or possibly in the following 5-Year Plan.

The tasks for this year can be fulfilled only with greater responsibility, initiative, conscientiousness at work, a stricter organization, improved work ethic, as well as a more demanding evaluation of people.

In conclusion, permit me to express to all you employees of the UNM as well as of the coworking organizations my faith that in the first year of the Eighth 5-Year Plan we will fulfill all the tasks. In regards to this, I thank all of you whose efforts have contributed to the successful fulfillment of tasks in the past year and I wish to all a successful 1986, and personal happiness and joy from work performed for the benefit of our society.

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SKODA PLANT CONTRIBUTES TO CEMA STANDARDIZATION

Prague CESKOSLOVENSKA STANDARDIZACE in Czech No 1, Jan 86 pp 9-10

[Article by Frantisek Kazda, Skoda Concern, Plzen: "Participation of SKODA Plzen in the CEMA Standardization Process"]

[Text] In addition to other areas, the SKODA VHJ (economic production unit) in Plzen with its six plants, namely the SKODA enterprise plant in Plzen, the Brno Engineering Plant 1 in Brno, the Slovak Power Engineering Plant in Tlmace, the Blansko CKD (Czech and Bohemian Kolben-Danek) enterprise plant, the Dukla CKD enterprise plant, and the SKODA VE (hydroelectric power plant) enterprise plant in Prague, is participating in the international division of labor of the CEMA member countries in the area of technical standardization. Cooperation in this area has been gradually developed since the very creation of CEMA in 1949. However, it did not take concrete shape until after 1962 when, at the 16th meeting of CEMA, it was decided to create a Standing Commission on Cooperation in the Area of Standardization (SKSN CEMA) as well as to create an Institute for Standardization with headquarters in Moscow as a specialized organization for fulfilling concrete tasks in the area of economic cooperation.

During the first era, the results of this cooperation were used in technical standardization documents, which were similar to standardization recommendations, abbreviated RS (Recommendation for Standardization), and were processed by the offices of SKSN as well as by other branch commissions, such as subunits of SKSN or other branch commissions from, for example, the Standing Commission for Cooperation in Engineering, the Standing Commission for Cooperation in Transportation, etc. The recommendations were very significant in the course of executing multilateral and bilateral agreements on the provision of goods among member countries of CEMA. These standardization recommendations were introduced into the national systems of technical standards of the member countries, which began to influence their unification in terms of contents as well as form. From 1962 to 1980, the CEMA authorities processed and accepted a total of 5,716 standardization recommendations.

		5.5LP			6.5LP				7.5LP		
	1974	1975	1976	1977	1978	1979	1980	1981	1982	1983	1984	1985
ŠKODA, k. p., Plzeň	13	14	19	23	22	24	32	44	45	50	36	39
KO-NOR	6	6	10	9	5	5	2	3	1	1	—	1
5 závody: 1 EID (elektr. stroje)	3	2	4	8	9	9	9	9	9	8	4	3
2 Nářadí	4	6	5	5	7	4	3	1	—	2	2	2
ZES: 3 Turbiny	—	—	—	1	1	3	5	5	5	4	3	1
ZES: 4 Jaderné elektrárny (IAE)	—	—	—	—	—	—	9	20	25	25	17	16
6 Elektrické lokomotivy	—	—	—	—	—	—	—	—	—	—	—	1
7 Ostrov (slévárenské zařízení	—	—	—	—	—	3	3	5	4	8	8	11
8 Klatovy (palivové pece)	—	—	—	—	—	—	1	1	1	2	2	4
9 I. BS Brno, k. p.						13	7	10	11	12	16	20
10 SES Tlmače, k. p.						1	2	3	2	1	2	3
ČKD Blansko, k. p.						1	1	2	1	1	1	1
ČKD Dukla, k. p.										4	3	3
VE ŠKODA Praha, k. p.											—	19
ŠKODA. koncern, PLZEŇ	13	14	19	23	22	39	42	59	59	68	58	85

11 Poznámka: IAE — úkoly tvorby normativně technické dokumentace mezinárodního hospodářského sdružení INTERATOM-ENERGO

Key:

1 Electrical machinery
2 Tools
3 Turbines
4 Nuclear power plants
5 Plants
6 Electrical locomotives
7 Ostrov (foundry equipment)
8 Klatovy (fuel furnaces)
9 Brno Engineering Plant I
10 Slovak Power Engineering Plant, Tlmace
11 Note: IAE-tasks in creation of the technical standards documentation of the International Economic Union INTERATOM-ENERGO.

In the CSSR, many organizations and enterprises, including VHJ SKODA in Plzen, participated in this process, calling upon standardization specialists in each of the plants of the concern.

After 1971, a new period began in the cooperation in the area of CEMA standardization when, at the 25th CEMA meetings in Bucharest, the "Complex Program for Further Deepening and Improving Cooperation and Development of the Socialist Economic Integration of the CEMA Member Countries" was approved. Among other things, this Program sets the task of working out technical standard documents for CEMA (now known as CEMA Standards) in order to use them directly in mutual deliveries among CEMA member countries.

In the first stage, these documents basically verified international technical conditions and were designated as follows: ST 1-71, ST 2-72, through ST 39-73, in accordance with the "Temporary Regulation on CEMA Standards." These included the standardization of cables, taps, cement, the calculation of results, etc., i.e., those things needed in mutual deliveries among CEMA countries without the necessary planned and organizational management.

On the basis of experiences in creating these standards, there is a basically new approach toward cooperation in the area of technical standardization in CEMA member countries since 1974, when the 28th CEMA meetings in Sofia approved the "By-Laws on CEMA Standards" and the "Agreement" on their application. In accordance with these by-laws, in 1974 the CEMA SKSN approved methodical instructions for planning, creating and approving, drafting and amending, checking, revising and abolishing CEMA standards, including the contents and procedures required when proposing standards.

The new work procedure was readily accepted in the CEMA member countries, and already in 1974 the CEMA SKSN approved the first annual plan for the creation of CEMA standards, covering 374 standardization tasks. At the same time, the prospects for the next period were assessed. Similar to when the standardization recommendations (SR) were drawn up, SKODA Plzen is participating in the creation of CEMA standards, particularly in the fields of steam turbines, nuclear reactors, hydraulic turbines, industrial steam and hot water generators, electric rotary machines, tools, fuel furnaces, machinery and equipment for foundries, etc., as well as in the cross-sectional fields such as standards for a Uniform System for the Documentation of Construction, a Uniform System for Technological Documentation, safety technology, etc.

Table 1 shows the number of CEMA standards creation tasks which were solved at the VHJ SKODA enterprise in Plzen from 1974 to 1985, i.e., during the Fifth, Sixth and Seventh 5-Year Plans.

It is obvious from the table that the VHJ Skoda enterprise in Plzen has been actively participating in standardization work at the CEMA work centers, as is documented by the increasing number of standardization tasks from one year to the next. Furthermore, the table shows that while the majority of the standardization tasks from 1974 to 1979 were from cross-sectional fields (processed at the CEMA SKSN), since 1980 the number of standardization tasks in individual fields has been on the rise (processed in other CEMA branch commissions), which has been the aim of the CEMA work centers and a totally logical conclusion of the overall process of moving from national standardization systems to a uniform international standardization system under CEMA.

In over 60 years of standardization activities, the people at Skoda have worked out many proposals for new standards, suggestions and views on proposals submitted, and by their personal participation in the discussions about standards at the national and international level, have always striven to contribute to the good name of Czechoslovak standardization in the world. Some of SKODA's original enterprise standards have served as the basis for international standardization recommendations of the ISA. One of these, for example, is the fitting system at SKODA, the basis for the subsequent creation for the international fitting system of the ISA.

The VHJ SKODA enterprise in Plzen will continue to participate in standardization work at the CEMA work centers, and wants to utilize all the experience of its specialists, technicians and, above all, standardization specialists, and thereby continue on the path which began in the beginnings of Czechoslovak standardization, where since 1922 it has played a significant role in the creation of state and international standards.

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EAST EUROPE/SCIENTIFIC AND INDUSTRIAL POLICY

ACTIVITIES OF CZECHOSLOVAK S&T INFORMATION CENTER

Prague RUDE PRAVO in Czech 7 Apr 86 p 5

[Article by Michal Strida: "Encounter With the System--Are We Using Information Rationally?"]

[Text] Some time ago, the book "Encounter With Rama," by A. Clark, a significant author of science fiction, was translated into Czech. The central theme of this novel is the inability on the part of human civilization to establish contact with a much more advanced civilization. None of the researchers who searched the giant spaceship from unknown distances in the universe for several weeks are able, in the final analysis, to answer the question as to why the ship actually came here and where it is going.

It would be sad if similar feelings were to arise in encountering another completely earthly system, for example, the system of scientific, technical, and economic information. Twenty years of activity by the organization which takes care of these matters--the Center for Scientific, Technical, and Economic Information (UVTEI)--are up in April this year. Apart from organizational, projectional, and methodological functions in developing information services for scientific-technical development, the organization also fulfills the function of an executive information center with national jurisdiction and with numerous international ties.

With the aid of methods used in industrial processing of information, it makes accessible the worldwide base of knowledge in the area of science, technology, and economics, both in the form of publications, computer-process data bases, and data available in micrographic form. The center fulfills its tasks in collaboration with information centers of industries and branches. And partner national information systems of the socialist countries have the same mission as has the UVTEI.

Easy Accessibility

Although we occasionally hear complaints that in this country there is no access to information, this is a claim which is not based on truth and primarily indicates the depth of ignorance on the part of the complainant which is, sad to say, quite widespread. It is a little like in the story in which the father gives up that about which he knows nothing at home (the birth of a son).

The similarity with a designer or scientist or manager who initiates development, research, makes significant decisions, and does not look, ask, or inform himself, as is done elsewhere (in our country as well as in the world) is quite significant: It is an ostrich-like policy which is designed to prevent finding out that others have long since solved the problem which we are preparing to solve.

The second psychological barrier is the fear of the unmanageable influx of information. Every 10 years the sum of scientific-technical findings doubles. Consequently, a number of particularly key economic managers believe that they could be overwhelmed by the flow of information.

However, there is still another slightly paradoxical fact which gets in the way of utilizing information. It is its cheapness and relatively easy accessibility. The free providing of information frequently leads to the belief that it is useless. However, one must remember that in the era in which we live it is precisely the speed and ease of accessibility to information which is more important than, say, the quantity of steel produced per capita.

All of these facts led to the establishment of the Reference Center of VTEI Resources within the framework of the UVTEI, whose mission is to guide users through the flow of information. It is supposed to help find the appropriate VTEI work station or another source capable of answering qualified questions.

Unusual Conversation

We have used a number of functions to test the system. The test and the form of a somewhat unusual conversation. We posed a total of 18 questions from various branches, beginning with agriculture and ending with culture; within a short space of 2 days we received answers to our questions. We excerpt from them:

1. Fixation of nitrogen by nonpapilionacious plants?

"More detailed responses are available from the Institute of Scientific Information for Agriculture. After becoming familiar with available literature and other specialized problems, it is possible to turn to the Microbiology Institute of the Czechoslovak Academy of Sciences." And there follow the names of specific persons, including their telephone numbers.

5. How many chemical solutions are known and how many were newly developed last year?

"The U.S. registration system Chemical Abstracts Service indicates that some 7 million chemical substances are on record. Annually, literature describes about 500,000 new chemical substances. The Chemical Abstracts Service system is accessible even to Czechoslovak users of the VTEI branch system for chemistry and chemical industry through the branch center of the VTEI at the Research Institute of Technical-Economic Chemical Industry--Central Information Service for Chemistry, Stepanska Street 30. Data, which are available in the domestic data base center of the UVTEI--Central Technical Base, were used."

Another of the possibilities is to access foreign computer systems and data bases in Europe and overseas through the communications link of Moscow--Prague--Vienna.

13. Transportation by pipeline systems?

"Far too general a question. No VTEI center was found which is charged with following the problem in a comprehensive manner. We list the centers and specialists for individual types of transportation." And there follows a listing of nine branch centers with names and telephone numbers.

15. School reforms in this country and in the world?

Fundamental research will be conducted by the Institute of Education Information at the Ministry of Education of the CSR--the State Comenius Pedagogic Library. Additional information will be made available by specialists of this institute. Here, a factographic collection on legal amendments to education systems for Czechoslovakia has been under way since 1970 and since 1980 for the CEMA countries.

16. Numbers of transplants of vital organs in the world and in Czechoslovakia?

Kidney: world--100,000, CSSR--1,140; heart: world--1,340, CSSR--10; pancreas: world--561, CSSR--11; liver: world--580, CSSR--3. Information was provided by the Center for Scientific-Technical Information of the Institute of Clinical and Experimental Medicine in Prague.

17. Preference of genre in literature in advanced capitalist countries?

The most basic data are available in UNESCO statistics. Detailed comparative studies apparently do not exist. It will be possible to use national bibliographies, a number of which arrive in Czechoslovakia.

With its topic, this question is only marginally within the jurisdiction of the reference center on sources of scientific, technical, and economic information. The wholesale book industry--the center of statistics and bibliographic information--can undertake a computer search on this topic based on Czechoslovak sources.

Conclusion

What is evident from the answers received? Primarily, that it is necessary to learn to communicate with the VTEI system, to pose questions which are the most specific and most substantive possible. Furthermore, it is the fact that the rapidity of gaining the information is adequate for the daily press and primarily makes it possible to work with specific people--specialists who are information carriers. The quality of the information available varies in various branches. In some sectors, for example, in chemistry, the system of obtaining information is more developed and more usable than, let us say, in culture.

The reference center and the entire scientific-technical information system also represent a very important feedback function. An analysis of the responses which were provided by the center last year indicates, for example, that the largest number of requests came from the engineering branch of the national economy (12 percent). This area also has the most widespread network of VTEI centers, although orientation in the services which they provide is fairly difficult for requesters from other sectors because of the extent of services.

In second place in the frequency of questions is the electrotechnical industry (10.5 percent), followed by energy and chemical industry, based on the number of requests, followed by agriculture, health, building material industry, construction industry, administration and jurisprudence, transportation, and the food industry. This is a heartening finding which essentially corresponds to the structure and dynamics of development noted in our national economy. A significant number of questions are directed from one branch to another. And it is precisely this that makes the reference center a connecting link of the VTEI system.

The geographic standpoint is also noteworthy. The largest number of requests made to the reference center (56 percent) came from Prague. The circle of users of these services of the reference center is also interesting. The most frequent group of users includes workers of the scientific research base, who make up 31 percent of the requesters; other users are production workers, students, etc.

The services of the center are also utilized by employees of the VTEI center and by libraries, particularly in the enterprise sphere.

I would like to close our view into the VTEI system by using a "sigh" voiced by an employee of the reference center: "It is significant for purposes of the access of a certain part of the public to information that Dr Cvach, a person of little sympathy from the hospital in the suburbs of the city, is the only one of the entire team of doctors who shows any interest regarding what is happening in his sector abroad. And even that is added to his burden."

Nevertheless, I believe that the VTEI system is not a sleeping Rama, but rather a ship which will carry us reliably through stormy waves of scientific-technical development into the next millennium.

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END